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ABSTRACT

Despite efforts to increase the participation of women in applied mathematics and technology, women are still underrepresented in these areas of study. A conference of those concerned with gender and science and technology (GASAT) was held to allow all those interested a chance to discuss advances in previous efforts and areas of concern. The numerous papers of this conference are contained within volumes I and II of this book. They are partitioned into the following areas: (1) Science and Technology Education in East and West Europe; (2) Changing Teacher Behaviours and Collaboration in Classrooms; (3) Students, Lecturers and Teaching Methods in Male Dominated University Contexts; (4) Attitudes, Behaviours and Preferences of Subjects at School; (5) Access to Engineering Education; (6) Encouraging Women to Professional Education and Career Development; (7) Values and Employment in Engineering in East and West Europe; (8) Restrictions and Strategies in Career Development; (9) Work and Family: Having It All; (10) Research Methodology; (11) Evaluation of Intervention Strategies; (12) Challenge and Perspectives of European Projects; and (13) A Look at the Future. Volume III contains the text of the four keynote addresses and reports of the workshops, home groups, postersessions, papersessions, and East-West Forum. (ZWH)

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Ten Years [of] GASAT (Gender and Science and Technology) Activities in a Changing Europe.

Contributions to and Proceedings
of the
East and West European GASAT Conference
(3rd, Geldrop,
The Netherlands,
October 25-29, 1992).
Volumes I, II, and III

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GENDER AND SCIENCE AND TECHNOLOGY

GASAT

October 25-29 1992

CONTRIBUTIONS

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Volume I

3

Ten years GASAT activities in a changing Europe

EAST AND WEST EUROPEAN CONFERENCE

Ten years GASAT activities in a changing Europe

CONTRIBUTIONS

to the conference October 25-29 1992

VOLUME I

Compiled and introduced by

Annita Alting
Marja Brand
Wilma Groenendaal
Ria Hermanussen
Marijke van Vonderen
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PREFACE

Three years ago, during the second European GASAT Conference in Jönköping, a group of participants was thinking about ways to continue discussions between researchers, teachers and policy-makers on the issue of Gender, Science and Technology on European level. It was felt that a European exchange should not be hampered by the absence of colleagues from East European countries. A full understanding of interactions between Gender, Science and Technology, includes cultural and historical data; learning from international comparison is a prerequisite. More effort should be given to encourage involvement from East European colleagues in the next GASAT Conference. When the Eindhoven University Group took the initiative to organize the Third European GASAT Conference in 1992 one of its main objectives became to get together participants from East and West Europe.

With financial assistance of the Eindhoven University of Technology a planning committee was constituted. The committee has taken full responsibility for all aspects concerning the conference, assisted by a Dutch and an International Advisory Board as well. All groups have been working hard to realize the third European GASAT conference as a meeting of colleagues from East and West, where current initiatives in research and intervention programmes will be discussed and joint European projects challenged.

The planning committee is thankful for support from the Dutch Ministry of Education and Science and also from Dutch industry.

Of course the most important contribution is coming from the participants. We received 43 papers of which 12 by authors from East-European countries. They have been classified according to the main themes and sub-themes of the conference and are published in that order in two volumes. It is our sincere wish that this flying start is the prelude of a succesful conference!

On behalf of the planning committee,

Marijke van Vonderen
Marja Brand

INTRODUCTION

GASAT conferences bring together women and men who are concerned to encourage research and interventions into all aspects of gender differentiation in science and technology education and employment. Gender aspects in the field of natural sciences and technology is the main subject of this book that consists of two volumes, containing the formal papers that have been accepted for the Third European GASAT Conference on Gender Science and Technology 1992. Following the tradition of GASAT-conferences the Contributions are distributed in advance of the conference. This procedure has also been used at the first and second European GASAT conferences at Elsinor, Denmark in 1986 and Jönköping, Sweden in 1990.

Objectives of this third conference are to provide perspectives on joint European projects and to stimulate exchange of ideas and experiences in each European country with regard to current initiatives related to intervention and research in education, schooling and employment.

Participants in the European GASAT Conference '92 represent approximately 25 countries. The planning committee received 43 papers which are organized according to four main themes and an excursion:

1. Education and Schooling
   This theme includes papers which deal with the social context of learning, instruction and eduction, but also includes papers which focus on the choice of school subjects, access to technical educations and continuing adult education in the area of career development.
   For this theme 23 papers are submitted; they have been subdivided into 6 subthemes.
2. Employment
   This theme includes papers which deal with values with regard to employment in engineering and the combination of work and family. Also papers focusing on restrictions and strategies of professional career

development belong to this theme. Nine papers are submitted for this theme and they have been divided in three subthemes.

3. Research Methodology and Evaluation of Interventions
   This theme consists of two subthemes, the first includes three papers which focus on research methodology and the second subtheme consists of three papers discussing evaluations of interventions.
4. Joint European Projects
   Three papers either discuss existing European projects or challenge setting up those projects

   Excursion: House of the Future
   In preparation of a GASAT-excursion to the Dutch House of the Future, two papers have been written. At the Conference they will be discussed in one of the Workshops.

Within each sub-theme the papers are arranged alphabetically according to the first author's name. Some of the papers contribute to more than one sub-theme. In that case other criteria such as distribution of authors form East and West Europe and a maximum of four papers per sub-theme have been used for assignment to a theme.

The English of the papers received before due time have been corrected, if necessary. We are grateful to Jan Harding for her mediation.

The formal papers published in these two volumes precede other contributions to be expected at the conference: the keynote addresses, poster papers and theses for round table discussions. They are the basis for exchange of ideas and experiences in paper sessions, workshops and round table meetings. The planning committee is looking forward to meet all of you at the Eindhoven conference.

Organization and members

* * *

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1 Science and technology education in East and West Europe

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Ten Years Ment-project
girls into physics and technology education

Marja Brand
Eindhoven University of technology

The Ment-project started in 1982 at the Eindhoven University of technology. The idea was to

- initiate changes in physics and technology education to get more girls interested and keep them interested in physics and technology
- initiate changes in problem awareness of teachers, administrators and schoolcounselors
- help schools and teachers to start their equal opportunity activities
- do research in the numbers of female participation in physics and technology education.

One of the things that happened was the start of the GASAT movement. Jan Raat, Ilja Mottier and Jan Harding were the mothers and father of a small network of GASAT friends.
In 1991 the Ment-project ended.

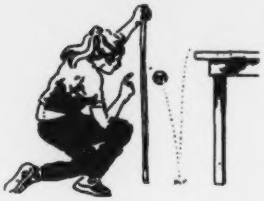
The start

Before the year of 1982 there were some activities in Eindhoven University to get more girls interested in a technology education at the university level. Marijke van Vonderen, Ineke de Raaff en Jan Raat were initiators for this project. They wanted to know how many/ how few women studied at technical universities. They wanted to make a map of the results and then try and find a way to change the numbers.

To find out possible solutions to alter the situation they seeked support and information from collegues. There was very little information about why girls opted out of physics and science lessons and the way to change this situation at that time.

In november 1981 a conference was organised at the Eindhoven university to exchange ideas with collegues working towards the same goals: Getting Girls into Science. Some thirty educational researchers and teachers from eight countries in Europe participated and they started what was called the GASAT network.[1]

The conference was mainly about girls from 12 - 14 years of age and about getting them into physics. Although ideas were born to stop the dropout from young women with a showed interest in physics to "female" vocational studies to become lab assistent, vet, physician etc.



The participants were mainly interested in changing the curriculum and the hidden curriculum of teachers.

One of the outcomes was not to speak in terms of lagging behind of girls, because it suggested girls were no more than disabled boys.

The recommendations that were agreed upon were:

1. Statistics must separate the data of girls and boys in order to make difficult educational outcomes visible.
2. An Information network must be built in order to facilitate communication between educators, scientists and researchers involved.
3. Teacher training can play an effective role in pre-service and in-service education. Both forms of education must be oriented towards the following objectives: make teachers aware of their own attitude, of classroom interactions and career opportunities for girls and boys in science and inform teachers about alternative strategies in science teaching.

The objectives cannot be fulfilled only by providing information. Other methodologies must be used too in order to bring about attitude changes.

4. Curriculum and teaching material can contribute to promote girls' opportunities

- sex discrimination in teaching materials and textbooks must be removed.
- examples and illustrations in textbooks must be based

upon girls' experiences too.
Science must be presented as an endeavour of women and men with historical, cultural, social and economic implications.
The content of textbooks must not be far away from daily life. Presentations should not be abstract, formalized and theoretical but rather concrete, connected with real life processes.
Science lessons must pay attention to the social implications of science and technology. They must deal with the benefits of technological development and the negative consequences and/or controversial issues.
Textbooks can use biographies of women scientists as illustrations of science as human activity.
Career material for girls must be developed.
And teaching materials must include a variety of methods (problem solving, decision making, design, hands-on activities etc).

5. Informative, social and emotional support must be given to young women. Examples are information about consequences of subject choices and non-traditional career opportunities. Social support could be positive image of female technicians in media, financial support, extra courses. And emotional support could be using role-models, and female networks.

The last recommendation was

6. More research is needed in order to know the problems and thereby change the situation. Longitudinal evaluation research into the effects of experiments. Important is to form a body of knowledge as basis for future experiences.

These recommendations were the basis for the Ment-project.[2] In may 1982 ir. Marja Lensink was the first co-worker to make the Ment-project into a succes.[3]

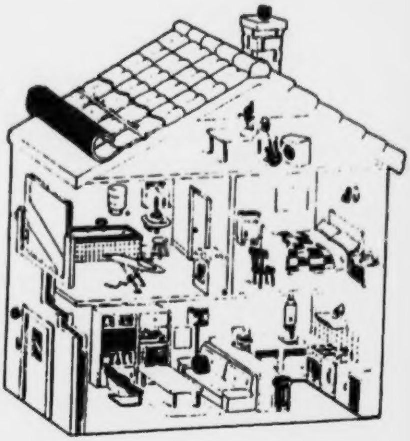
Three phase project

1982-1984

The first phase of the project was mainly collecting data and bringing statistics about girls in physics and technology education to the attention of teachers to make them aware of the problem. Physics textbooks were examined to see whether they contained elements that disadvantaged girls. Guidelines were established for the production of new textbooks and teaching materials dealing with the content of instruction and the language used, the illustrations, the examples and the illustrative texts. Video's were made to study interaction between single and mixed-sexe groups in hands-on activities.

1984-1987

In the second phase was curricula design the topic. "Girl-friendly" fysic lessons based on the interest of girls were made and experimental tested. The lessons were about electricity in and around the house, the eye and seeing (optica and light), energy and the body and measuring time. A large investigation was done to find out the differences that lead to less interest in physics by girls.



Girls find physics less usefull for their personal life. They are however interested in topics related to the body and the natural world and they are unaware of career opportunities in physics and technology.

The position of young women at Senior technical training colleges (STT) (16-20 years of age) was investigated. The purpose was to find out what attracted them in technical studies and the motivation to study at STT.

Motives to study at STT were

- the practical work, working with your hands
- the concrete work, seeing immediately what works or not
- the feeling of control over things
- being able to design, make and repair things
- wanting to know how things work
- the interesting study
- the interesting career opportunities.

Also teachers and male students' attitudes towards female students was object of study. Results showed that school-administration and teachers can play an active role in informing and attracting girls and their parents' attention to career opportunities for women in technology. Mixed feelings in teachers attitude towards female technicians influence the class climate negative. Technical schools with more female teachers are more positive towards activities to attract female students and have less dropouts.

1987-1991

The third period was the most rewarding one. Technical women were made visible in statistics and becoming more visible in the awareness of the public. The information the Ment-project could provide was very much wanted/ needed and a lot of teacher support was given[4]. The information recource center worked pretty good[5] and a network of teachers was formed.

A thesis on pupils attitude towards technology showed the importance of starting at very young age with technology lessons. The differences in attitude towards technology are formed at a very young age. At the age of ten years it can be measured and it does not change all that much in the ten years following. Primary science lessons will be of enormous importance to keep girls interested in science and technology.

A research into profiles of girls at STT gave more information about information and others influencing girls' choices.

The girls have parents with positive feelings about the possibilities to succeed for their doughters.

The parents let their doughters free to choose a study of their own choice.

The girls belong to a girls-scene where freedom to choose is accepted.

The girls have reasonably to good marks in math and reasonable to average in physics.

Most girls visited open-days/ activity days for girls at STT*. The girls get little negative feedback about their wish to go to STT from teachers, counselors, parents, family, (girl)friends.

They value working in the long term future.

They expect to succeed in STT and to be able to cope with fellow students as part of a minority group.

They also have a clear view of the difficulty of the lessons and of students interaction at STT. They know what to expect.

The profiles point out that the information given to future students about STT is nessesary and also that the role of teachers, parent and counselors is very important.

Ment-project at end

It is very difficult to state the importance of the project. Results are not easy to be attributed to the work of the co-workers.

Tabel 1:

Deelname van meisjes aan technische opleidingen.[2]

	1968		1978		1988	
	abs	*proc*	*abs*	*proc*	*abs*	*proc*
lts	*556*	*0,4*	*8417*	*4,2*	*5209*	*6,2*
mts	*24*	*0,1*	*264*	*0.6*	*1449*	*2.3*
hts	*32*	*0.3*	*455*	*2.2*	*1843*	*5.7*

If there is a slight increase of girls in physics and technology education that may be the result of nationwide advertising, the change in attitude towards technology and female technicians or the work of the Ment-project. Fact is that a lot of people knew where to find us and needed the information we gave to them.

There are two contradictory explanations for the fact that girls opt less for physics and technology education:

* girls do not choose for physics and technology lessons because they have a lack of information. They know little about technology because they were never confronted with technology en never learned about it at school. They will never choose for physics and technology out of not-knowing and not-caring.

* girls do not choose for physics and technology lessons because it is a male dominated setting where you cannot easily survive as female. Technology has a "macho" image where women cannot feel at ease. Girls have enough information about technology and the technological world to say no to "male-technology". They have strong feelings about technology use and abuse.

Both explanations can be true. The Ment-project wanted to break down the "macho" image of physics and technology.

We did it by showing that the image is there allright but it can change and by explaining how physics and technology can be made gender inclusive in which gender no longer leads to a better or lesser interest and/ or performance. Ten years of Ment-project will not be enough to change ages of sex biased education, but still we believe we did make a difference.

---

1. Raat J. Harding J. Mottier I. Girls and Science and Technology, Eindhoven 1981

2. Brand M. Eindrapport Ment-project, Eindhoven 1991

3. The participants at the conference made a promise to keep in touch and they did: GASAT mondial conferences were held every two years. The sixt one was in Australia 1991, the seventh will be in Canada 1993.

4. One of our leaflets for girls about senior technical training (STT) was printed 18.600 times and used in information campaigns by STT colleges.

5. Ten years of Ment-project was good for approximately 150 speaches and workshops about girl-frienly fysics, school-career counseling for technical studies and professions, gender free curricula designing, equal opportunities etc.
About 3000 teachers were personally involved in lectures, workshops and experiments. About 100 research reports were written and send free of charges to teachers, scientists, administrators, industries. The project-information journal (in total 580 pages information) was send quarterly to 2500 schools, institutes and private home adressen.
The developed school materials (3 video's, 4 brochures en several fysicbooklets) was send free of charges to every one asking for it. Hundreds of schools were involved in theme-sessions about girls and fysics or girls and technology. Every year about 120 people asked for advise/ help/ material which we provided if possible.
Thirtytwo co-workers were involved in all the activities, some for short others for lengthier periods, as researchers, advisers and collegues.

6. At open-days and activity days they get information about STT. The variety of work you can do as engineer. They meet female role-models and discuss career opportunities. They also get information from female students about the studie, the fellow students etc.

GENDER, SCIENCE, TECHNOLOGY AND ENGINEERING: EDUCATION IN BRITAIN AND BULGARIA

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Abstract

The existence of a gender gap in Britain with regard to physical science, computing and engineering is compared with its apparent absence, at least in the educational system, in Bulgaria. Indeed in some cases it is reversed. Why is this? For comparison reference is made to British studies on classroom behaviours and student choices. In Bulgaria a core curriculum has existed for many years, with a prominent role given to science and technology. However, in pursuit of western individualism there is presure to introduce more choice into the curriculum, with preliminary signs that this is producing western style gender effects. The role of changing ideology in Bulgaria is assessed, as is the status of engineering, the high level of girl's school performance and rather formal teaching methods. It is concluded that Bulgaria has succeeded in presenting science and particularly technology as gender neutral in schools, but that this success is now in some danger. The material is based on two academic visits to Bulgaria in 1987 and 1990.

General background

The countries of the former communist block in Eastern Europe have been much more successful than Britain in presenting technology and engineering as gender neutral throughout the educational system. It is the purpose of this article to try and understand how this has come about, using Bulgaria as an example for closer consideration. This issue is particularly important for Britain, as shortages of technologically qualified personnel exist and a national curriculum is being introduced into England and Wales which gives science and technology a high profile.

Researchers visiting Eastern Europe before the collapse of communism (1), (2) to investigate gender related issues have reported being met with genuine surprise, mild amusement and comments that the problem was solved because the State was ideologically committed to equality. Virtually no feminist movement seemed to exist, and there was some reverse concern over the 'feminisation of the intelligentsia' (3). However, research mainly published in the west has shown that in spite of some impressive achievements (4), particularly in education, widespread differences in occupation between the genders do occur in these societies (4), (5), and that this can be understood by the phrase 'womens double burden' (i.e. women have to work and look after the home) rather than any notion of equality (6), (7).

Attempts in Britain to interest schoolgirls in technological subjects has met with slight success, with the proportion of students who are female that are admitted to universities (8) to study mechanical engineering rising from 2% in 1974 to 10% in 1989, electronic and electrical engineering from 2% in 1974 to 7% in 1989 and in computing dropping from 24% in 1974 to 13% in 1989. At each choice point in the educational system, more and more girls opt out of technologically oriented subjects. Kelly (9) observed many instances in schools of boys dominating girls in laboratories, ridiculing girls' attempts at work, gaining more of the teachers attention and acting as though they had priority for apparatus. Durndell (10) found a gender gap in favour of boys in knowledge and use of IT amongst school leavers, and furthermore this gap stayed constant between 1986 and 1989.

The following discussion draws on the experiences of two visits to Bulgaria in Autumn 1987 and in the disturbed circumstances of November 1990:

The subject of computer science has become male dominated in Britain. What of Bulgaria? The first problem is that the computer revolution has only recently begun to hit Bulgaria, such that the situation is similar in some ways to that in Britain perhaps 10 years ago. For example, whilst about 18% of British households owned home computers in 1991 (12), Domozetov (13) reported that only 3.7% of Bulgarian scientists had home computers. The subject of computer science is a new one in Bulgaria, and official statistics are hard to find (14). However, Domozetov (15) has carried out some of the apparently few studies in Bulgaria that even raise the issue of gender and computing, with a study of the introduction and use of computers in the Savings Bank and amongst scientific workers. In the Savings Bank he found a situation similar to Britain, in that most of the routine computer operators were female, and most of the managers were male. The scientific workers were rather different, with more of a gender balance amongst those using computers at a professional level.

An interview carried out by the author in November 1990 on a 23 year old female systems analyst in Bulgaria is another source of information. She said that in her undergraduate education, which was oriented towards electronics and telecommunications, about 70% of the students were female, and she was very surprised when informed of the situation in Britain where only 10% of similar students would be female. She commented on the very poor level of practical work at her university and the domination of her education by lectures. She also was of the view that students perceived engineering and computing as easy subjects to study, which is not the case in Britain.

The situation with regard to gender and computer science in Bulgaria was thus unclear, although it did not seem to be the same as in Britain. The situation with regard to gender and engineering was, however, dramatically different to Britain, with the Bulgarian government ***restricting*** the proportion of admissions into engineering degree courses that were female to 50% in order to stop women dominating engineering. Compared with Britain, where getting 10% of undergraduate engineering admissions to be female is seen as something of a success, Bulgaria is dramatically different. Why?

(a) *Low status of engineering:*

It was argued that engineering had a low status in Bulgaria, as shown by the relative ease of getting on an engineering course. For example in 1987 the Higher Institute of Mechanical and Electrical Engineering reported that it was having difficulty filling some of its courses, whilst places to study law, humanities and social sciences were greatly oversubscribed. It was argued that the salaries earned by engineers were not particularly good, and that potential students were also put off by the knowledge that the available level of technology in industry was low (14).

Thus, it was argued, because female students were highly motivated to get a degree, any degree, they took the easy option and chose engineering. (Why relatively weak male students would not take the same strategy was not explained.) The major flaw with this as an explanation is that engineering courses in Britain are also difficult to fill, engineering is seen as of low status in Britain with only average pay rewards, and yet very few females apply to study it.

(b) ***Perhaps all gender differences have been eradicated in Bulgarian society?:***

This is clearly not so (4). Furthermore some gender differences do occur in higher education in Bulgaria (14), and they show some similarities to the situation in Britain. For example, health, medicine and education are numerically dominated by female students, whilst maths, physics and chemistry tend to be dominated by male students. Engineering is spectacularly different from Britain, and in general more female students seem interested in technology than in Britain.

These gender differences represented a failure of Bulgarian government policy. In spite of the lack of reaction to questions of gender, Jancar (11) pointed out that it has been an accepted part of government educational policy in Eastern Europe for many years to, where deemed necessary, produce gender quotas for higher education subjects. The success of this policy has been very unclear, and definitive statistics have been difficult to identify. One of the purposes of establishing gender quotas for subjects was to prevent the 'feminisation of the intelligentsia', as girls on average left school with considerably better qualifications than boys and 57% of university students in Bulgaria were already female by the 1980's (14). This raises another question:

(c) ***Why do girls outperform boys in the Bulgarian education system?***

A number of possible reasons were suggested: Firstly it was argued that girls behaved better than boys, that they were more diligent and matured earlier than boys. If this was the case it presumably would be linked to stereotypes of typical male and female behaviour, and fits in with an international trend which includes good educational success within the stereotype of expected female behaviour.

Secondly the existence of a core curriculum in Bulgaria, such that almost all school students of both genders studied the same subjects throughout their schooldays, including scientific and technological subjects, prevented girls from opting out of these technological subjects. The desire to do well overcomes any negative feelings about these subjects and girls thus tend to leave school well qualified in these areas. It was interesting to note that Britain and Bulgaria appeared to be moving in opposing directions here. In Britain a core curriculum has recently been introduced, and one of the main reasons for it was to stop large numbers of girls from opting out of physical science study at a young age. Conversely, as part of the new found concern for individuality and choice, there are experimental attempts underway in Bulgaria to introduce more variation into the curriculum. Unpublished preliminary data from the schools involved indicates that one of the effects of this is indeed to increase gender differentiation in course choice with girls tending to avoid physical sciences.

A third argument was that the teaching of science and technology in Bulgaria was heavily theoretical and lecture oriented, and that this suited the girls. There seemed to be a consensus both of foreign researchers and among Bulgarians themselves that Bulgaria had a major educational problem, in that you cannot teach science, computing and engineering properly unless the students spend much of their time doing laboratory work and projects. The problem is that you must be able to afford the necessary apparatus for schools and higher education. If it were the case that girls preferred lectures and theoretical rather than practical study, then that could explain the good Bulgarian girls' performance. However, it should be pointed out that conversely one of the strategies discussed at GASAT meetings (16) to attract more women into physical science has been to *increase* the practical and real world element of study.

Another question is raised by this discussion: Why is it a problem that girls do well in the educational system in Bulgaria, why is it not something to be pleased about? One response (1) was that female graduates were more likely to enter administration and education than go into industry where it was argued that they were needed. Another response related to teaching styles. It was argued that females were happier with rote learning, memory work and lecture material, and were not as creative as males. Bulgarians appeared to be very concerned about creativity and the past stifling of initiative, linking this to the formal lecturing style of teaching. There is a contradiction here however, as on the one hand females are accused of preferring theoretical and abstract study rather than practical work, and on the other hand they are accused of not being so good at abstract and creative work.

(d) *A synthesis?*

Whilst the status of engineering, girls motivations, the attempted eradication of gender differences in Bulgaria, school behaviour, teaching styles and the core curriculum all seem relevant to explaining the female interest in technology in Bulgaria, none appears totally convincing alone. The following represents an attempt to make sense of these factors:

The proclamation of gender equality by the Communist state could be argued to have been a partial sham, in spite of some achievements, particularly in education. Much of the population have relatively recently migrated from a traditional rural peasant culture to an urban situation, but are very keen that their children, including girls, should be educated well. A degree, any degree, is seen as a great honour and family pressure to obtain one would be strong. However, traditional male routes into the male dominated hierarchy would be by means of the study of administration or law, so girls would not be pushed or attracted in that direction. At the same time Marxist-Leninism glorified science and engineering as the foundation of the progress of society (17) so these subjects had an important role in schools, and engineering comprised a large proportion of the opportunities available in higher education. The core curriculum ensured that these possibilities were open to girls, as did girls' relatively good performance at school, possibly aided by the lecture based means of teaching. Thus many girls strongly motivated to be involved in higher education were directed towards engineering and were able to take up many places that were relatively easy to get into.

The Future

This article has attempted to understand why Bulgaria has been so successful in attracting females into engineering and technology. The issue is complex, but a core curriculum certainly seems to be one important factor. The dramatic changes going on in Eastern Europe societies contain opportunities and dangers. The opportunities include the existence of a large pool of female schoolchildren and students who are both qualified and interested in physical science and technology. They represent a large reservoir of talent and expertise that can help Bulgaria enter the information age - a reservoir the envy of some other countries. The danger is that in throwing out everything associated with the old Communist regime, Bulgarians might decide to throw out notions of gender equality and remove or water down the core curriculum with its compulsory science. If this happens it may have the effect of removing many girls from the study of science and technology. It is to be hoped that this does not occur.

Acknowledgements

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THE PHILOSOPHY OF TECHNOLOGY EDUCATION IN OUR DEMOCRATIC SCHOOL

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Technology education must be adapted to the cultural milieu as well as to the progress and changes of our democratic society, to the scientific and technological innovations. The prepared reform of the educational system has to be a key social activity in the new market economy. Our system of education cannot be reformed in isolation independent from high-technology world. Technology is an organic part of our culture and technology education must be a substantial feature of modern general education in the democratic society helping to develop ones personality in accordance with the needs of the society.

Technology education interfacing the society is understood to be necessary precondition of successful implementation of specialized education and professional orientation of pupils resulting in a concious career choice of further studies or taking a job. Technology education must be a principle of the modern educational policy. The specific system of school technology has to be carried out in different levels of formal and informal education.

Integrated technology programs being realized from the kindergarten through upper secondary school are the bases for the curriculum development for 2000.

1. Some remarks on the Czechoslovak school system and its history

Czechoslovakia is a country of great traditions in culture and education. The beginnings of education on the territory of present-day Czechoslovakia are connected with the church schools in 9th and 10th century monasteries. First lay schools are recorded from as early as the 13th century. Very important impulse to the development of education in our country was the founding in 1348 of the Prague University by Czech King and Roman Emperor Charles IV. This first university in Central Europe became a center of education, influenced the development of education and, later, the process of national self-awareness.

The school reform of 1774 introduced the compulsory six-year school attendance for all children. Compulsory eight-year school attendance for all children aged six to fourteen was enacted in 1869.

The first secondary schools / Latin gymnasium/ have their roots in the 14th century. First practical schools, precursors of later specialized secondary schools, began to arise in step with the economic development and expansion of industrial production at the end of the 18th century.

In the independent Czechoslovak state after World War I, schools underwent market development. A network of common schools was completed, the number of secondary schools increased, and new universities came into existence. February 1948 followed the Communist government and several educational reforms were carried out. Their characteristic mark was a uniform school and central control, the national curriculum for all school subjects. The last reform, in 1976, enacted 10 - year compulsory school attendance.

The "Velvet Revolution" in 1989 and the democratisation of our society has a great influence on our school system, which is at present changing. The new school system will devote the greatest attention to the upbringing, training and education of the rising generation from the aspectd of the democratic development of our republic. That means to systematically create conditions to be free, healthy, educated a well prepared for the life in the democratic society, for them to absorb all that is wise, noble, honest and beautiful, and the progressive values created by mankind. We would like to open our country to Europe, to the world and from this point of view weare preparing the new school system. In view of the growing complexity of the tasks to be tackled at the beginning of the next century by whose who at present attending school, Czechoslovakia's state bodies adopted a long-term programme for perfecting the Czechoslovak educational system, which will be reformed during the next few years. The purpose of the fundamental changes in the work of our schools is to improve the quality of training and education, to ensure a higher standard of tuition, to give the opportunity to the gifted children to develop their abilities. We have to continuously improve the curricula, teaching programmes, textbooks, other study materials and teaching-aids, to introduce modern and effective form and methods of instruction.

Our education will develop in the European context. The government guatantees that Czechoslovakia will continue establishing further political changes aimed at integrating our republic into the family of West European and other democratic countries. Since February 1991 Czechoslovakia has been a member of the Council of Europe and has cooperative relations with the European Communities.

After the 'Velvet Revolution' in 1989 several decrees were issued by the Ministry od Education of the Czech Republic and Ministry of Education of the Slovak Republic concerning the system of basic and secondary schools, private schools, decentralization in the school system, changes in higher education, teaching foreign languages etc. Compulsory school attendance was shortened to 9 years and is conducted entirely in basic school.

In our country preschool education has been a part of the educational system since 1948. Preschool educational facilities are kindergartens, caring for children above age three. The focal point of children's activities in preschools facilities is play. At present kindergartens were attended by 90% of all children.

The basic school / abroad called primary school/ is divided into two levels; lower level / 6 - 10 years/ and upper level /10-15 years/. At the lower level the pupils master basic facts and knowledge. They are taught by a single teacher. At the upper level the pupils are habituated to the fact of each subject being taught by a different teacher. From 5th class pupils can be differentiated according to their interest and abilities, to attende basic schools with an extended curriculum of math, languages, sports etc.

Having passed from the basic /primary/ school the pupils transfer to one of the secondary schools /only some 5% will not continue in further education/, viz:[1]

- 4 year secondary general school /gymnasium/, terminating with a final examination - some 18% of pupils
- 4 year secondary vocational school / mechanical, engineering, electrical engineering, agricultural, health service, conservatories etc./ terminating with a final examination - some 30% of pupils
- 3 - 4 year secondary training /apprentice/ school terminating with a apprentice exam, by 4 year training also with a final exam - some 52% of pupils.

Since the 1990/91 academic year there have been introduced some 8 grade gymnasia / for the leavers of 5th grade of the basic school/ and the special family, economic and health service schools / two grades/ for the leavers of the 9th grade of the basic school.

In our school system there are different types of special schools for handicapped children.

The highest level of our educational system are the universities. For the full university studies the curricula are 4 - 6 years long. The new university law of 1990 incorporates a three-year bachelor's curriculum.

The democratisation of our society brought about pluralism in the school system. The new aspect of these changes is a foundation of so called " alternative education - independent schools" - in addition to the state schools we have also some public schools and church schools.The number of these schools is increasing.

2. Technology education as a part of modern general education

A global perspective of technology education must be adapted to the changes and progress of our democratic society, from

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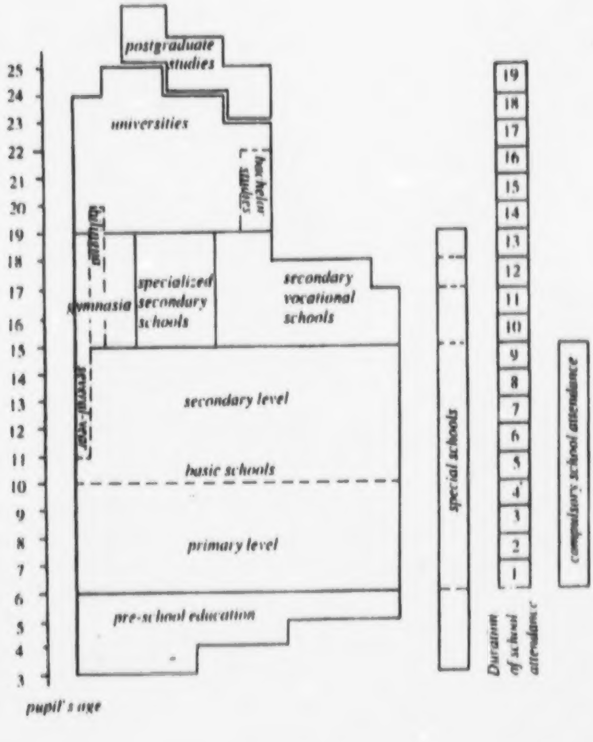
[1] see the Czechoslovak school system - next page

A scheme of the CSFR educational system


postgraduate studies
universities
bachelor studies
bilingual
gymnasia
specialized secondary schools
secondary vocational schools
several-year
secondary level
basic schools
primary level
pre-school education
special schools
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compulsory school attendance
Duration of school attendance
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pupil's age

the point of view of the scientific and technological innovations. Let me present such key as: Which type of education should we take to build such a society? It should be necessary to see educational reform in the wider context of social and economic reform. In Czechoslovakia this problem is more important now because we are transfering to the market economy and in education we have to respect the needs of labour market in the democratic society developing its industry and other spheres of economy on high technological level. I would like to remember that education is a key social activity and cannot be reformed in isolation independent from scientific and technological progress. The development of creative abilities of a Man is a precondition for the developmnet of our democratic society. We cannot educate the personality for 21st century without technology education, we cannot return to the "pure" general education from the period between the World Wars. We are living in the world of advanced technology and technology education has to become an organic priority of educational reform of our general educational schools. It should be a part of educational standards, a part of "Education for All", which is worldwide project began by UNESCO.

Technology education is a principle in general education, not only a technological subject being taught in the basic school and gymnasium. It is also a specific system of modern technology introducing the pupils to the technological information, knowledge and skills. School technology which is carried out both in compulsory and optional constituents of school education as well as in various forms of pupils'activities is closely linked with work education. In the main, it forms the organic part of its sub-system. From our point of view the underestanding of the scientific bases of informatics and production and the acquiring of the abilities to handle simple tools, which are used in production, constitute the basis for further development of some sort of specialized education.

At present our basic / primary/ schools and general secondary schools / gymnasia/ have aspects of applied school technology:

- In general education subjects - primarily in natural science, mathematics, geography with the emphasis on practical applying and development of skills, but also in the other subjects as well such as social studies, language etc. In these all subjects the teachers have to develop the practical application to technology, the laboratory methods of work, problem solving with practical goals as well as to develop the respective skills and attitudes involved. In the new curriculum for these subjects the technological applications have to be more emphasized and the teachers better prepared from point of view of technology too.
- In special compulsory technological subjects, in each grade starting from the lower level of primary school to the upper secondary level. Our proposal supposes that these special subjects would include topics from general technology and facilitate the discovery of individual talents, aptitudes, interests and the potentials related to industry and technology through laboratory activity and problem solving. At the present time at the lower primary level / 1st to 4th grades/ the curriculum comprises compulsory subject work education for 1 hour a week. At the upper level of primary / basic/ school /5th to 8th grades/ 2 hours a week are devoted to work education. The content of this subject is mainly oriented to testing theoretical knowledge, to the acquisition of basic working skills in different fields of work and particularly in handicraft, electrotechnical and electronic work, cultivating land and breeding agricultural plants, in the preparation of food as well as in hand and machine sewing. In the new established 9th grade of primary school there are some new technological subjects.

  Into the curriculum of the secondary educational schools the new subject called Informatics and Computer Technology has been introduced, but the other technological subjects belong only to the optional education - they are no more compulsory.

- In the most varied forms of special-interest technical, agricultural and other activities / e.g. computer application/ in schools and other educational institutions /e.g. Youth Club groups, computer centres, Scout-movement, in YMCA,YWCA etc/.
- In the development of pupils'special interest particularly in the Vocational Activities Competition in the framework of which the students of gymnasia prepare independently the solution of various problems of industry,research, computer application, etc.

The new proposal of the school system in Czechoslovakia has to support the positive development of potentialities of every member of our democratic society and to prepare them for the increasing speed of change in the living enviroment. We remember that without compulsory technology education in each grade of the primary and secondary general education we cannot fulfil this goal. Technology education, its system has to reflect changing economic circumstances in our country which is transfering to a market economy. The experience and research results of technology education developed in Central and Eastern Europe will be analysed and compared with the basic concepts and prospective trends of technology education in the more developed countries, incorporating the newest developments in science, technology and economics.

An innovative framework project of general technology education as a new, higher quality form of formal general education and non-formal education will reflect the new conditions of Central and Eastern European democratic societies and their transfers to market economies, as potential future members of the European Community.From this point of view in the collaboration of UNESCO we are solving how to best prepare the next generation for life in a high industrialized democratic society of 21st century.

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Gendered Subjects Coming Together: Power and Gender in the Design and Technology Curriculum for England and Wales

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The introduction of the new subject of Design and Technology into the national curriculum for England and Wales is aimed at developing technology education without perpetuating its former association with masculinity. The new subject is to be taught by teachers from a number of previously distinct areas and is centred around home economics and craft, design and technology. However, both subjects have a history of low status within the curriculum, associated with their function of supporting the hegemonic status quo in conveying traditional gender rôles to mainly working-class students. While the positioning of design and technology as a 'gender-balanced' subject within the extended core curriculum has opened up the potential for change, it is taught by those whose entire previous careers have been in areas notable for their embodiment of traditional gender and power relations. This paper outlines the basis of the traditional 'masculinity' of crafts and the 'femininity' of domestic subjects, and considers whether, given this history, it will be possible for a new, 'gender-free', subject to emerge.

The introduction of the new subject of design and technology (d&t) into the national curriculum for England and Wales represents the coming to fruition of attempts to raise the profile of technology education in schools (McCulloch, 1985). Due to the position of the new subject as part of the compulsory curriculum for both primary and secondary school students, its future now seems secure. Furthermore, the subject has been defined in such a way as to attempt to avoid the gendering that so often accompanies technology education. Design has been made central, and the materials to be used range from wood and metal to textiles and food, the idea being that the processes of design are applicable and transferable over a number of media. The teaching staff come from a number of previously existing subjects, the central group being home economics (HE) - this includes both food and textiles - , craft, design and technology (CDT), business studies, art and design, and information technology, and are expected to work together within an overall interdisciplinary structure. It is thus intended to counteract the gendered nature of these subjects by integrating them around common themes and processes.

This gendering, however, is deeply embedded in the epistemology of the subjects concerned, and arises primarily out of their historically hegemonic function. This is particularly the case as regards the subjects which are the focus of this paper, CDT and HE. I shall argue that, from their very inception, these subjects had as a major part of their purpose the perpetuation of a particular social structure, and in particular the transmission of ideological messages concerning the position of working-class students, especially girls. The immersion of teachers of these subjects, through their training and careers, in such ideological positions, is likely to make it harder for them to move to a new curriculum in which gender and class biases no longer underpin both content and rationale.

The concept of hegemony is first found in the work of Gramsci (Gramsci, 1971), and is

> designed to explain how a dominant class maintains control by projecting its own particular way of seeing social reality so successfully that its view is accepted as common sense and as part of the natural order by those who in fact are subordinated to it.
>
> Jaggar, A. (1983) *A Feminist Politics and Human Nature* (Sussex, Harvester Press) quoted in (Lewis, 1990) page 474

Hegemony is internalised and thus insidious; it is the means whereby dominant groups reproduce and perpetuate their dominance. Hegemonic forms are so embedded in social practices that they form a part of what Schutz calls our 'thinking as usual' (Schutz, 1964). Teaching which supports hegemonic structures therefore has embedded within it a view of the dominant social order which sees it as an unquestioned normality. The result is that the general population comes to consent to the requirements of the dominant social groups, and social order is thereby maintained without force (Foucault, 1977, 1980).

The antecedent subjects of d&t have historically had such a hegemonic function, in terms of the perpetuation of both gender and class positioning. The domestic and craft subjects are two of the most long-standing areas of the curriculum. While they were not offered to all, they were generally considered essential for some students, and justified largely in terms of their suitability for and utility to these groups. Both their presence in the curriculum and their content reflect a hegemonic perspective on the social rôles of working-class men and women, and, historically, have acted to prepare students for such rôles. Thus, each curriculum area is strongly associated with one gender and has, for most of the last century, been closed to the other, by both formal and informal means. The teaching, and in particular, the atmosphere of the lessons, has conveyed stereotypes of masculinity and femininity, with craft workshops reflecting the all-male world with which they have traditionally been associated (Equal Opportunities

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Commission, 1983; Thompson, 1989) and female-dominated home economics departments conveying a model of domesticated femininity that suggests that a woman's place is at the centre of an ordered and peaceful home (Attar, 1990; Turnbull, 1987).

The gendered nature of the domestic and craft subjects has particularly powerful hegemonic force. This gendering arises out of social structures which support the domesticity of women and the association of men with work with resistant materials. Consequently, although these subjects are now almost universally offered to both sexes in mixed schools, they are still regarded by students as being predominantly for one gender or the other (Grafton, et al., 1983). Connected with this is the class-based idea that these subjects are not for the more academic student (Attar, 1990; Penfold, 1988), reflecting the traditional association of the working classes with manual labour and domestic service, whether in one's own home or that of another. Thus in their very presence or absence in the curriculum for different groups of students, these subjects convey messages about these groups' rôles in society. Such messages are embedded in the epistemology of the subjects concerned, and in the teachers' 'thinking-as-usual' about the world; they are thus conveyed unselfconsciously and, although at times resisted (Attar, 1990), generally come to be seen as normal by both teachers and students.

Home economics

Home economics is a subject that from its very origins is both gendered and classed. This is due to an association of women's homemaking rôle with the preservation of order in society and the control, through this rôle, of the behaviour of all family members. In the mid nineteenth century a concern for the morals and health of the poor, particularly in the cities (Hunt, 1987), led to the introduction of domestic subjects, for girls only, into the elementary schools. A general fear of the potential of the working classes to spread both disease and dissent, was combined with the belief that the family, conceived in a particular way, would act as a stabilising force, centred around women as homemakers, and the domestic training of young girls was designed to counteract what was seen as a worrying trend in the industrial centres. Poverty and malnutrition were attributed to a lack of domestic management skills on the part of working-class women; it was believed that this might be remedied by the introduction of classes in cookery, needlework, cleaning and laundrywork (Purvis, 1985), even though

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the schemes of work employed often had little relevance to the actual living conditions of working-class women (Attar, 1990, Turnbull, 1987).
The teaching of domestic tasks in ways that had little relevance to the realities of the students' lives was combined with a presentation of an image of family life to which they were expected to aspire and which encouraged them to regard poverty as an individual issue, amenable to individual thrift, and the maintenance of a 'respectable' home as entirely their responsibility.

The presentation of a bourgeois view of family life has persisted throughout the history of the subject (Attar, 1990), giving particular emphasis to the creation of order in the home (Wynn, 1983). Housework was elaborated, within home economics, into a complex and time-consuming ritual, performed for 'love', with this elaboration and economic devaluing presented as if normal and unchallengeable (Wynn, 1983).

Home economics was essentially conceived as a girls' subject, centred around the woman as homemaker, although it had the convenient dual function of training working-class girls as domestic servants (Attar, 1990). The subject has remained centred around the home and the traditional woman's rôle and is still linked to an attempt to address the problem of supposedly inadequate parenting (Grafton, et al., 1983). Although in recent years there has arisen a rhetoric of gender-free 'skills for living', this centrality of women's traditional function in the home has been emphasised by the compulsory combination, in the criteria for the GCSE[1] examination in home economics of the previously separate areas of the family, home, food and textiles. In contrast to the seemingly gender-neutral discourse of 'life skills', this reinforces the underlying message, that what home economics is really about is the one thing these four areas have in common, that together they encompass the traditional rôle of the housewife and mother (Attar, 1990).

Until recently, home economics was only taught to girls, whether in mixed or in single-sex schools. At examination level, when students are able to choose some of the subjects they study, there is little takeup from male students, especially of textiles and child development, although some boys do study the food option (Grafton, et al., 1983; Wynn, 1983). Students have very clear views about which subjects are supposed to be for boys and which for girls and may feel uncomfortable about what their friends would say if they make non-standard choices; teachers controlling the option process may also discourage such choices (Grafton, et al., 1983). From within the home economics community, there have been attempts to encourage takeup by boys (Green, 1989), often by stressing the 'service' aspects of the subject to de-emphasise its gendered nature. However, this emphasis on service still reflects the traditional view of a woman's rôle, both at home and in the workplace (Thom, 1987).

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[1] General Certificate of Secondary Education, usually taken at sixteen. There are no compulsory subjects (until the national curriculum reaches this stage), although most students take English, mathematics and science and about five other subjects, chosen with guidance from teachers.

Craft, Design and Technology

Craft, design and technology (CDT) has a dual origin in vocational training and in the idea that crafts are an essential part of a liberal education, although the vocational, more masculinised, side has been dominant throughout (Penfold, 1988). It also shares with home economics a past associated with working-class students and the inculcation of moral training and industrious habits. Part of the inculcation of bourgeois family values into the poorer classes was the importance of regular labour to a respectable life. Manual training was intended to promote this (Penfold, 1988). Although craftwork was also promoted for both boys and girls for educational reasons, it was only in practice provided for boys, and other motives also took their place in the promotion of handicrafts in elementary schools. Concern that educating the working classes was some to aspire beyond their station (Davin, 1987) led to hopes that the promotion of manual work would lead them to be more satisfied with their lot (Penfold, 1988).

At the same time, the inspection system that schools had to undergo to obtain funding for craft subjects restricted the work to skills testing, and the making of useful objects was not encouraged (Penfold, 1988). As a result of this, the aim to introduce manual instruction as part of the liberal education of both sexes finally failed, and until the 1970s it remained a skills-based subject taught almost exclusively by men to boys. Even after the 1975 Sex Discrimination Act, much segregation remained (Grant, 1983), exacerbated in some cases by a refusal on the part of male craft teachers to have girls in their workshops (Grafton, et al., 1983). It remains a largely male-dominated subject at examination level. Part of this is due to the continuation of a masculine, even macho atmosphere in many workshops (Equal Opportunities Commission, 1983; Grant, 1983; Morgan, 1988; Penfold, 1988). Technical competence is also an integral part of masculine gender identity (Wajcman, 1991), connected to its embodiment of 'traditional male attitudes, values and job aspirations' (Thompson, 1989).

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Gender, Class and Status

The gendered nature of both home economics and CDT is intimately connected with differentiation along class lines. This happens not only through the belief (originating in patterns of employment) that, for example, domestic subjects were more important for working-class than for middle-class girls (Purvis, 1985), but also through the operation of ideas about 'ability'. In this, the hegemonic function of the domestic and craft subjects is shown by their absence as much as by their presence, being kept by and large in the less academic, lower status areas of education (Attar, 1990), (Penfold, 1988). From the start, higher status girls' secondary schools either did not teach home economics at all, or gave domestic subjects low status and inferior facilities (Purvis, 1985; Summerfield, 1987). Only those considered not 'able' enough for more academic studies took practical subjects to examination level. A similar differentiation took place regarding the 'male' craft subjects, although the boys' grammar schools resisted them altogether for longer (Penfold, 1988). Even after the introduction of secondary education for all in 1944, domestic and craft subjects remained firmly the province of those at the bottom end of the academic spectrum (Attar, 1990; McCulloch, 1985; Penfold, 1988). This has the dual force of emphasising the link between the working classes and manual labour; and of excluding students from higher status knowledge by taking up time that could be used for other, more marketable qualifications (Attar, 1990).

Teachers of practical subjects have made a number of attempts to break their association with 'lower ability' students, although they have been less proactive regarding their gendering. Home economics has attempted at various times throughout its history to forge a link with science (Attar, 1990). At the same time, the low status of workshop subjects led many of those advocating an increase in technology education to look to the sciences rather than to crafts for a lead. Many projects were aimed at the more able and as a result made a clear demarkation between metalwork and engineering (Penfold, 1988).

Exclusion

It is not just the content of the craft subjects that serves to perpetuate the hegemonic social order, but their very presence in the curriculum for some and absence in that for others. The inclusion of a considerable time spent on domestic subjects (both compulsorily in the past and through the option choice system today) (Attar, 1990) can only mean the exclusion of other, possibly more useful, areas of study. Once the domestic and craft subjects had been promoted as being more suitable for particular groups of students, such students were then encouraged to study them as an alternative curriculum. While it may be argued that such a curriculum forms a useful preparation for the sort of work that such students are likely to perform in later life, it also restricts them to such occupational fields, by reducing the number of qualifications they possess in higher status subjects. While the content of the 'practical curriculum' in some cases overtly prepares girls, in particular, for the unequal relations of particular working arenas (domestic service earlier this century, commercial offices today) (Attar, 1990; Black, 1989; Keely and Myers, 1983; Summerfield, 1987; Valli, 1987), the sheer amount of time that such a curriculum takes up of itself closes off options that should perhaps remain open.

This is not to argue that there is at present an explicit attempt to use the promotion of one sort of knowledge deliberately to exclude the acquisition of other, higher-status kinds, although this has happened in the past. Nevertheless, Attar argues that the interest, in the late nineteenth century, in establishing domestic science for girls as an alternative curriculum to the physics and chemistry taught to boys (Hunt, 1987), was connected with attempts by middle-class women to gain access to a more academic education (Attar, 1990). However, as noted above, even where this succeeded, it was not taught to all girls, and was resisted by those middle-class girls' schools aspiring to the provision of an academic education similar to that experienced by boys, and who only taught domestic science to their less able students (Summerfield, 1987).

Conclusion

The domestic and craft subjects have thus throughout their history produced and supported hegemonic structures of both gender and class. It is therefore not surprising, given the years they have spent learning and teaching matter within which such structures are deeply embedded, that it is teachers of these subjects that have been found to be most traditional in their outlook (Kelly, et al., 1987). The very nature of their subjects perpetuates a conventional view of the world, and in particular of gender rôles. And although it is understood that access to the more able students would give them higher academic status, the needs of survival have often led teachers of both craft and domestic subjects to stress their importance to the 'less academic' student (Attar,

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1990, Penfold, 1988), thus perpetuating divisions within the curriculum and ensuring that the 'more able' continue to be counselled away from such options

In providing in the school curriculum subjects that appeal directly to images of masculinity (Willis, 1977) and femininity (McRobbie, 1991) held by working-class teenagers, these students are led to make curriculum choices that not only have socially conservative social structures as part of their overt and covert content, but also (by taking up time) exclude them from pursuing subjects with more value in both the academic and employment marketplaces (Attar, 1990; Penfold, 1988). The domestic and craft subjects thus have a dual hegemonic force: they perpetuate dominant group values while at the same time preventing the targeted students from having access to an alternative and possibly more liberating curriculum

Design and technology has been conceived as a subject which contains the possibility of breaking down such gender and class divisions, through a common experience for all, based on the design cycle. The bringing together of such strongly gendered, previously low-status areas is seen as a way to remove the gender and class bias of each, by showing the commonalities between them, and giving more importance to design work generally. (At the same time, there is already a move to 're-gender' design and technology by allying its content more closely to that of CDT (Brown, 1992; Smithers and Robinson, 1992)). The removal the traditional forms of strongly gendered subjects from the curriculum, while retaining their educationally valuable features, is a laudable aim; however, it may not be so easy to carry out in practice. The essential feature of hegemonic structures is their insidious 'normality'; they are manifest in those things most easily taken for granted. The thinking-as-usual of those teachers who are now to teach design and technology is, by the very nature of their subjects and their training, bound up with traditional rôles and values. It will therefore not be a simple matter for them to move forward into the new subject without bringing all their hegemonic baggage with them

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I REFLECTIONS ON GASAT WORK IN THE FIELD OF EDUCATION AND SCHOOLING

2 Changing teacher behaviours and collaboration in classrooms

Changing teachers' attitudes to gender issues in education. Systematical classroom observation an instrument!

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INTRODUCTION

In this article we describe the fourth stage of a European Community action-research project, integrating the issue of Equal Opportunities for boys and girls and classroom management into the curriculum of teacher education. First we will give an overview of recent literature in the field of interaction and Equal Opportunities, national and international. Then we will hoghlight the objectives to systematically assess the effects of the curriculum on problem-awareness and attitudes of teachers by means of systematical classroom observations. Ans last we will discuss the improvements we made in our observation system.

GENDER ISSUES IN EDUCATION

The interest in gender issues and education must be seen as part of the democratic development which is characteristic of Western countries in the second half of this century. Because of the economic need of a highly educated labor force an enormous increased number of people - from the entire population - participates in some formal education. The ascend and emancipation of minorities and groups from lower-class origin consequently resulted in moving to higher levels of education. Coeducation became the norm in western countries. Finally, a democratic society needs nature independent citizens who themselves can collect the information to make decisions. As a result, the emphasis shifted in schools from a transference of knowledge to a passive student population to the encouragement and training of students and an active gaining of knowledge. Theaching methods have been extended to include more interactive and cooperative learning-strategies.

EQUAL OPPORTUNITIES FOR GIRLS AND BOYS IN EDUCATION

In spite of a general consensus on the desirability of equal opportunities for girls and boys in education there is a great lack of agreement on where to start and how to act. Recent publications give some good examples of different ways of dealing with the problem.

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Our search through international educational databases like DION, EUDICED, ERIC and BEI resulted in a few titles that dealt with our subject, and several titles that dealt with parts of it. Together they may give an overall picture of actions in the period 1984 - 1990 about equal opportunities, gender issues, interaction between teachers and students and possibilities of educational change through teacher training both inservice and preservice. (Engelfriet, 1989).
Enders-Dragassar and Fuchs analysed in a study of the Hessian schools (1984) the everyday schoolpractice of the "hidden curriculum". In normal classroomsettings, where male-dominated rules and values prevail, girls have little opportunity to develop their potential. They suggest reducing of the male dominance and increasing female approach will encourage girls to improve their schoolresults
Moreover the occupational structure of primary school teaching and teachers' careerperceptions show a market gender differentiation. As Evans (1984) points out, teaching is regarded suitable for women but a second rate career for men. However, administration jobs and careers are very much male-dominated. Thereby schools show their pupils from an early age on that men are more important than women.

Both Kant and Event (1985) argue the optionsystem enables 13-year old pupils to make wrong careerchoices. It seems to intensify gender-bound and traditional subject choises. By limiting the obtions boys and girls achieve a higher level in non-traditional areas. For equalitarian reasons they advocate a broad curriculum, including domestic and technical subjects. In the same issue Cross (1985) questions the beneficial effects of coeducation. Certain research shows that boys gain and girls lose on academic work. An area which received considerable attention is gender differentiation in classroom interaction. Yet as Dart and Clarck (1988) point out, methodological deficiencies in earlier studies diminish its impact. Therefore, they suggest to base further research in this field on sound research and more complex perspectives than the relatively simplistic sex difference approach.
And indeed, Croll (1985) who observes more extensive systematically the classroom activities and interactions, finds only a few teachers inclined to spend more time on boys than girls. Althought the pattern recurred for all male and female teachers. In this study the imbalance arises from difficulties in classroom management. Children with special difficulties and a few pupils claim a disproportionate amount of the teacher's attention. And in both catagories boys outnumbered the girls.

Fennema and Peterson (1986) conducted a very advanced processproduct study on teacher-student interactions and academic levels of achievement in mathematics. Their findings prove the large complexity of genderdifferentiation when other variables are taken into account as well.
However they come to the conclusion that differences in mathematics' achievement are related to differences in gender and in independency. Thus, in order to solve the higher level problems, girls should be more stimulated to think independently.

Surprisingly it was not the amount of teachers' attention that related to girls' higher achievements. Instead it was the right kind of feedback, like praising and prompting the strategy. All these studies indicate that some kind of genderdifferentiation is present in the interaction between teachers and students. Therefore, if we want equal opportunities, it should also be a topic in teacher training.
Here Myers (1985) advocates to set realistic rather than idealistic goals; planning short-

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term changes while aiming at long-term effects. But, as Kant (1985) points out, projects to changing teachers' attitudes have inconsistent results: whilst cooperative teachers are rewarded, opposing teachers are strengthened in there prejudices. And Millman (1985) states that though reports on equal opportunities may open peoples eyes, they not necessarily move them to implement appropriate solutions. According to Tonic (1987), classroom observations of verbal interactions give a much more truthful picture of what actually happens in the clasroom.

Sadker and Sadker (1986) conclude in a study of 46 collegerooms males twice as likely to be non-participants and to silently sit and observe classroom interaction.
As a result of their observations of 60 science classes using the Brophy-Good-Teacher-Child Dyadic, Jones and Wheatly (1989) reported that males not only evoked more frequently, but even if they did not, teachers mote frequently appealed to them directly (see also Sadker & Sadker 1990). Moreover, they observed that if teachers of science called for volunteers, males were more likely to be one. When science teachers organised demonstrations, males carried out 79% against only 21% by females. In Germany, Prengel (1985) observed similar classroom behaviour.
Finally Crosman (1987) analysed teachers interactions with boys and girls with the aid of a hand-processed observation system (Flanders, 1970). It concerned science lessons at a coeducational comprehensive school in England. Three classes were observed for both physics and biology lessons. The fourth class was observed for physics only and the fifth for biology only. The students were in their first year at school. Each subject was similary taught by well-experienced male and female teachers. All educated their personalteaching specialist subject in the participating classes (Table 1). The study involved 135 pupils, 65 girls and 70 boys.

Table 1. Classes taught by each teacher

				Phisics	
		Mrs U	Mrs S	Mr T	not observed
	Mr X	3B3.3W1			
Biology	Mr Y		3W4		
	Mr Z				3W2
		not observed		3R1	

Table 2. The Flanders interaction analysis categories

Category Code	Behaviour
1.	Pupils engage in constructive work either practically or mentally, with a minimum of overall confusions and concomitant teacher silence
2.	Praise or encouragement by the teacher
3.	Teacher accepts or develops pupil's ideas
4.	Teacher asks (a) cognitive memory (recall) question (b) more complex question
5.	Teacher gives facts or information
6.	Teacher gives directions for procedures
7.	Teacher criticizes or justifies her/his authority
8.	Pupil respons (a) recall or description (b) generalizations, inferences, etc. (c) asks for clarification of teacher directions
9.	Pupil initiation. Expresses own ideas, intitiates new topic, develops opinions or lines of thought
10.	Confusion, little or no work being done.

The adjustment was made in using a colour coding (general=pencil; girl=red; boy=green) to indicate who was involved in the interaction. The observation interval was extended to four seconds because of the physical difficulties of using three different writing tools whilst having to concentrate on observing the categories. It proved impossible to time intervals with a stop-watch unless there was little variation in activity.

RESULTS

The analysis of the various interaction categories (table 3) shows that the largest sex difference was in category (7), criticism. Boys received three times more criticism from teachers than girls. Slightly more teacher's questions were put to boys than girls (categorie 4). Yet this difference is not statistically significant. However, there was a marking difference in category 8. Here boys answered more questions than girls. When girls were asked a question they general could answer it. They did not answer questions unless specifically asked to. Furthermore significant were sex differences in category 3. Teacher accepting or stimulating pupil's ideas. This may be linked to a greater willingness of boys to respond. As boys answer more questions it is not surprising that their ideas are more likely to be accepted by teachers.

TABLE 3 The percentage of all classroom talk involving girls and boys

	All teachers			Female teachers			Male teachers			Physics teachers			Biology teachers		
	girls		boys	girls		boys	girls		boys	girls		boys	girls		boys
(2-9) All interactions	223	...	324	199	...	332	247	.	316	247	...	374	199	..	275
(2-7) Teacher talk	151	...	211	133	...	218	167	.	224	159	...	250	143	..	192
(8&9) Pupil talk	72	...	103	66	...	114	77		92	88	..	124	55		83
(2) Praise	09		09	07		09	11		09	06	.	10	12		08
(3) Acceptance	37	...	63	35	...	68	40		58	36	...	63	39	..	63
(4) Questions	28		33	26		36	30		30	25	.	41	30		26
(4a) memory	21		27	22		30	20		25	22	.	34	20		21
((4b) complex	07		06	04		06	09		06	03	.	07	10		05
(5) Information	15		14	09		10	20		19	10		14	20		15
(6) Directions	53		70	48	.	65	58		74	73		94	32		45
(7) Criticism	09	...	30	08	...	29	11	..	32	08	...	27	10	...	34
(8) Pupil response	60	...	86	57	..	95	62		77	74	..	109	45	..	63
(8a) recall	29	..	46	33	..	56	26		35	34	..	59	24		33
(8c) seek clarification	20		25	15	.	23	26		26	32		35	09		15
(9) Pupil initiation	12		18	08		20	15		16	13		15	10	.	21

'Note that figures in this table are percentages of total classroom talk (categories 2-9), not percentages of total classroom time, as in table 2 Figures don't sum to 100 per cent because general talk to the whole class is not shown.

. sex difference significant beyond the 5 percent level.
.. sex difference significant beyond the 1 percent level.
... sex difference significant beyond the 0.1 percent level.

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Table 3.1 Teachers interaction. The percentage of classroom time taken up in different behaviours

	All teachers	Sex of teacher Female	Male	Subject taught Physics	Biology
(2-8) Teacher talk	68.9	63.8 ...	72.1	61.1 ...	74.9
(889) Pupil talk	14.7	14.9	14.5	17.2 ...	11.8
(1) Silent work	17.0	20.9 .	13.1	21.5 ..	12.5
(2) Praise	1.7	1.6	1.8	1.5	1.9
(3) Acceptance	8.4	8.1	8.7	7.8	8.9
(4) Questions	8.6	9.0	8.3	9.1	8.1
(4a) memory	6.1	7.1	5.1	7.5 .	4.7
(4b) complex	2.5	1.8	3.1	1.7 .	3.2
(5) Information	26.5	22.7	30.2	16.4 ...	36.7
(6) Directions	19.0	18.8	19.1	23.1 ..	14.8
(7) Criticism	3.8	3.6	4.0	3.0	4.5
(8) Pupil response	12.3	12.6	11.9	15.0 ..	9.6
(8a) recall	6.5	7.5	5.5	7.8 .	5.2
(8b) generalization	2.1	2.0	2.3	1.9	2.4
(8c) seek clarification	3.7	3.1	4.3	5.3 ..	2.1
(9) Pupil initiation	2.4	2.2	2.6	2.3	2.2
(10) Confusion	0.4	0.6	0.2	0.2	0.6

.	difference significant beyond 5 per cent level
..	difference significant beyond 1 per cent level
...	difference significant beyond 0.1 per cent level

Evaluation

The general conclusion is that gender differences are in some respects apparent and in other areas invisible. Due to the unobtrusive nature of gender differences in classroom interaction, authors have developed methods and instruments to explicitate this. Variables concerning teachers are further specified in behaviour categories. For example lecturing, questioning, giving feedback and even personality traits. The gender of pupils is extended with variables like level of achievement, learning ability and the occurence of behavioural problems. One of the challenges of these outcomes is to apply them to teacher training, both preservice and in-service. Confronting teachers with their own interaction with boys and girls seems to be a powerful way to initiate the change towards a more equal approach (Dolle et al, 1990).

EQUAL OPPORTUNITIES AND TEACHER EDUCATION

Methodology

The design of the course

Based on the research findings and our own experience in the field of educational change and teacher training we designed a course on 'Equal Opportunities and interaction'. There Equal Opportunities is employed as an essential element in teachers progression towards a full measure of professionialism. This is additional to the educational theories and methods teachers are confronted with in their educational learning process (Boeije-Dolle, 1989).

Contents

Trying to make the participants aware of the problem of Equal Opportunities, we looked at it from many different viewpoints. Thus, they had every opportunity to relate the issue of Equal

Opportunities to their own unique knowledge and experience. Informative sessions alternated with group discussions. This enabled them to compare their individual differences and to share common concerns. At the same time new information had to be added to the existing knowledge and experiences. The group process therefore entailed adjusting, comparing and sharing. It resulted in new insights and new problem-solving strategies to be discussed by the group. New ways of handling a shared problem were also found.
By developing cooperative learning as an organisational strategy we activate teachers to increase their problem awareness. Moreover, it encourage them to reflect how they deal with differences and simularities between boys and girls in the classroom.
The aim is to heigthen their professional skills and the quality of education.

The methods used, concentrated in three areas:

- **in the cognitive area.**
  Information is given on differences and simularities between boys and girls. This information must be closely linked with teachers' daily experience. Thus the degree of recognition is high and the cognitive dissonance can be overcome.
- **in the affective area.**
  Exercises and group discussions are used to make participants aware of their opinions and convictions to discuss them, to accept them, to interchange them and to adjust them.
- **in the behavourial area.**
  An assignment to develop a positive action plan for the training activities to be transferred to the appropriate target groups' teaching situation.
  The opportunity to practise new behaviour in classroomsettings and to analyse and evaluate the (videotaped) lessons with help of the computer (Feedback Research Observation Guide). Furthermore, to get feedback and to get feedback on the interaction patterns between teachers and students.

OBSERVATION AND FEEDBACK WITH THE AID OF A COMPUTER

The Feedback Research Observations Guide System

During the training (Dolle et al, 1990) a computer steered observation system (FROG) is used to study and shape interactive teaching behaviour. Teachers can practice interacting with boys and girls in a classroom situation; the lesson is recorded on videotape and observed. This provides the teacher with feedback. The aim is that teachers develop a realistic and consistent attitude toward gender issues. And furthermore to dispose of enough alternative didactive methods to change teachers' teaching praxis towards boys and girls. For a large part teachers are totally unaware of the problems gender causes in schools. These are rooted in disparities in the sozialization of boys and girls. Some of the differences in approach are conscious reaction to observed dissimilarities between boys and girls ("boys make greater demands for attention; girls are harder workers than boys"). Incidently, recent research demonstrates differences to diminishe when other variables are included in the analysis. Such variables are the level of achievement and independence of the students, and the content and frequency of feedback by the teacher. (Linn and Hyde 1989).
Therefore the development of a systematical computer based observation and feedback system can be instrumental in assessing and improving the interaction patterns of actual teaching derived from FIAG (Chartaigh Ni, Harrison, 1988).
It suits in centrally organised classroomsettings but less useful in individual or groupwork classroomsettings. The number of headline system categories used is ten out of the possible

fourteen (Rodenburg et al, 1987). Harrison, 1988). For practical and economic reasons the number was extended to thirteen by splitting three categories (male/female).

The categories used were:

1. Illustration;
2. Lecturing;
3. Question (lower cognitive level, reproductive);
4. Question (higher cognitive level, productive);
5. Thinking pauze;
6. Indication (boy);
7. Indication (girl);
8. Answer (boy);
9. Answer (girl);
10. Pupil's initiation (boy);
11. Pupil's initiation (girl);
12. Teacher's response;
13. Silence or confusion (excluding thinking pauses and including periods of confusion in which communication cannot be understood or classified by the observer).

SYSTEMATICAL CLASSROOM OBSERVATION

Organization

After the courses we videotaped and analysed 16 classroom lessons (prospective language teachers, Leyden) and 8 micro-teaching lessons (graduate students taking a prepatory course in teaching, technical university Eindhoven). The (student)teachers taught language, mathematics and science for fourty minutes in real classroom settings (Leyden) or micro-teaching situations (Eindhoven).

Analysed were fifteen minutes in which most of the interaction between teacher and students took place (Table 4).

Table 4. Teachers interaction The average frequency and average percentages

category	frequency	(average)	percentage (average)	
	Leiden (language)	Eindhoven (science)	Leiden	Eindhoven
Question (lower level)	21	15		
Question (higher level)	9	15		
Thinking pause	8	15		
Indication (boy)	13	6		
Indication (girl)	11	8		
Answer (boy)	28	18	9 %	5 %
Answer (girl)	21	10	8 %	3 %
Pupils initiation (boys)	3	3	1 %	1 %
Pupils initiation (girls)	2	1	1 %	0 %
Teachers response	34	28		

RESULTS

From the results one can see that the average number of questions is for both groups equal. However there is an evident difference between the quantity and quality of questions and answers. Furthermore the balance between the different ways of addressing boys and girl was greater in the language courses than the science courses. Asking for further explanation and calling girls by name may be more succesful to stimulate (verbal) engagement of girls.
Although a considerable amount of questions is asked, students heve limited time to answer questions and think them over. This is even more so for girls than for boys. Especially in the sciene courses boys are twice as much involved in teacher-student interaction.

IMPROVEMENTS ON SYSTEMATICAL CLASSROOM OBSERVATION

In the last year we gave a new dimension to the observation and feedback system. On the basis of our experiences in several national and international workshops we came to two major improvements
(Verbruggen, 1991).

Table 5: An example
Filename: Jon cbl Made from Timefile: John tim.
Date: 1991/6/17/1, Time of beginning 6 58.24.24. Resets 0

Category	Frequency	Time(sec)	Percentage	Central Point 2)
Illustration	3	8	3 %	0.53
Lecturing	10	76	33 %	0.52
Question(lower level)	6	22	10 %	0.50
Questions(higher level)	3	12	5 %	0.43
Thinking pause	4(2)	25	11 %	0.25
Indication(boy)	2(1)	10	4 %	0.38
Indication(girl)	2(1)	6	3 %	0.57
Answer(boy)	3(2)	21	9 %	0.68
Answer(girl)	4(1)	13	6 %	0.63
Pupils initiation(boys)	1(0)	9	4 %	0.47
Pupils initiation(girls)	0(0)	0	0 %	0.00
Teachers response	8	28	12 %	0.55
Silence/confusion	0	0	0 %	0.00
Total	44	227	100 %	

( ) following after Question (higher level)
2: Central point during the teaching period.

In the results table at the end of an observation one can see how many of the observations in the categories "Thinking pause", "Indication (boy)", "Indication (girl)". "Answer (boy)", "Answer (girl)", "Pupils initiation (boys)" and "Pupils initiation (girls)" followed after "Question (higher level)".
This will provide more information on the interactions taking place after questions and particularly on the possible differences between boys and girls in this respect.

A SYSTEM WITH TEN CATEGORIES

Until now this system could only be used with the 13 category system described above. Presently it can be used separately. The system focusses teacher reactions on answers or initiations of pupils. It is important to know what preceded the reaction of the teacher to obtain information about possible differences in reactions following girls' or boys' behaviour. Therefore, the observant can choose from the following four indicators. "Answer (boy)", "Answer (girl), "Pupils initiation (boys)" and Pupils initiation (girls)". Thus, the reaction categories are linked to pupils behaviour.

The following ten categories are used to describe teacher reactions :

- Encouragement
- Direction (indicating wright or wrong in answer/initiation)
- Echo
- Improvement (teacher improving answer/initiation)
- Criticism
- Answering
- Cooperation (giving hint or cue)
- Participation (passing on to other pupils)
- Suggestion (stimulating further explaining of answer/initiation)
- Repetition (teacher repeating question)

Both changes were to get more detailed information about the following issue: Does the (this) teacher making a difference between girls and boys regarding the quality and quantity of questions and reactions.

The changes are illustrated in table 6.

TABLE 6: AN EXAMPLE

<F 5> = Reset <Escape>
<F 10> = Break
< 3 > = Echo

< 1 >	Encourragement	
< 2 >	Directions	
< 3 >	Echo	
< 4 >	Improvement	< F1 > Answer(boy)
< 5 >	Criticism	< F2 > Answer(girls)
< 6 >	Answering	< F3 > Pupils initiation(boys)
< 7 >	Coöperation	< F4 > Pupils initiation(girls)
< 8 >	Participation	
< 9 >	Suggestion	
< 0 >	Repetition	

Filename: aa.tbl Made from timefile: aa.tim; Date: 1991\7\16\2
Time of beginning: 16:44:53; Resets: 0; Total time: 1 min. 29 sec.

	Teachers respons to:							
	Boys			Girls			Total	Central Point
Category	Answer (2)	Total (3)	Initiat. (1)	Answer (2)	Total (3)	Initiat. (1)		
Encouragement	2	3	1	1	1	0	4	0.45
Direction	0	0	0	1	1	0	1	0.23
Echo	1	1	0	1	1	0	2	0.71
Improvement	1	1	0	1	1	0	2	0.16
Criticism	0	0	0	0	0	0	0	0.00
Answering	0	1	1	0	1	1	2	0.56
Cooperation	0	0	0	0	0	0	0	0.00
Participation	0	0	0	1	1	0	1	0.60
Suggestion	1	1	0	0	0	0	1	0.98
Repetition	0	0	0	0	0	0	0	0.00
Total:	5	7	2	5	6	1	13	

. the indicator choosen on the left side highlights and flickers.

CONCLUDING REMARKS

Evaluation of the training has revealed that teachers who complete the training are primarily stimulated to think consciously about their own teaching. They are encouraged to develop methods to help girls catch up with boys in the area of formal education, and to make educational and employment choices. It will make them equal in the social political and economic spheres. This self reflective attitude is an essential component of the professional growth of teachers and students, boys as well as girls.
The focus on all of the quantity and the quality of teacher students interactions is to get students to work actively at learning. Learning is enhanced when instructional materials are actively manipulated by both male and female students.
The task of the teacher is to present students with learning activities. The improvement of social and didactic interaction skills is an extremely effective means of achieve this end. In short, questions can incite, stimulate and to help to facilitate the process of thinking, learning and decision making on the forementioned aspects. The FROGsystem is an effective aid as a feedback tool. It creates opportunities for reflection and self evaluation. It enables an attempt on equal approach towards girls and boys by looking in a praxis oriented and school coded mirror.
The computer based observation- and feedback systeem teaches the individual teacher responsibility for the personal choices of educational priorities as formulated in the curriculum framework on Equal opportunities and Teacher education (Arnesen, Charthaigh, 1988).
And last but not least, it highlights the crucial role the teacher plays in confirming or changing the traditional expectations and restrictions for boys and girls in education. By using the FROGsystem gender in equity remains no longer a blind spot in the process of educational reform and restructure of schools and teacher education.

In the next year we as a project team hope to investigate the impact of feedback using the refined and improved FROG on teaching practice (making pre-test and post-test of teaching behaviour on Equal opportunities and interaction) in everyday praxis before and after the training.

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A TEACHER TRAINING COURSE ON GENDER INCLUSIVE STRATEGIES FOR TEACHING SCIENCE & TECHNOLOGY[1]

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Teachers should be educated to deal with gender differences in science and technology education. This was set as a goal of the training program for technology teachers for lower secondary education. The Australian GAMAST-project[2] was the main source of idea's for the construction of a special course on this topic. A study comparing educational projects such as EQUALS[3], COMETS[4], GAMAST (McClintock[5]), GIST[6] and SATIS[7] with respect of gender inclusive features was another important source of information.

The course consisting of twelve weekly meetings has been attended last year and this year totally by about 115 persons. The backgrounds of these people were very diverse, such as: non-teachers, former teachers of the sciences, former teachers of crafts and arts and design, former teachers of home economics and former teachers of primary school children. They were asked to indicate their learning expectations and special needs concerning this course, after a short explanation of the course program, on a questionnaire at the first meeting and they write a short final report on this issue.

In this paper I will give a short outline of the aims, the content and the learning activities of the course. After that I will present the results of the evaluation of the course: 1) what are the benefits of the course according to the reports of the participants, 2) what pitfalls did occur and what compensation was found with respect to the expectations and special needs of the participants, 3) what are relevant differences in the indicated needs and reported benefits by male and female participants and by people with a high and low technical background.

The case of technology education

The training of teachers for technology education for lower secondary education is an extraordinary task in the Netherlands, because technology as a subject is recently implemented in general secondary education. The aims of this new subject imply that technological literacy has become an objective for every child, while on the contrary in the past technical education exclusively has been associated with a special kind of vocational education, which can be followed in stead of general secondary education. Teachers of the new subject are confronted with the task to establish a new image of technology, to examine which values are connected with technology and to look for appropriate teaching strategies.

The Teacher Training College of the Central Netherlands Polytechnic offers a four year program for the certificate for technology teaching. The course on women and technology is a part of this program, which comes to meet the requirements formulated above with respect to gender issues.

Who are the new teachers of technology and what are their expectations of a course on women and technology?

The teachers in training of technology have very diverse backgrounds. Many of them have been teachers before, some have not. They are former workers in industry, former teachers of the sciences, former teachers of crafts or arts and design, former teachers of home economics, former teachers of primary school children and former teachers of disabled children and so on.

They were asked to indicate their expectations and special wishes concerning the course on women and technology at the first meeting after a short explanation of the course program. For that purpose they got a short questionnaire of one page. Firstly they could write down some information about their own backgrounds. Secondly they could tick which statements out of ten expressed reasons why this course on women and technology could be of value to them. Finally they could write down some additional comments. Before looking at the results of this questionnaire and discuss how these have been token into account, I will go into the aims and the program of the course a bit more.

The aims and the program of the course on women and technology

Teachers should be able to deal fruitfully with gender differences in technology education. This is formulated as a goal of the training program for technology teachers. Therefore the aims of the course on women and technology have been worked out as follows:

1. Participants can explain by examples the importance of technological literacy for any citizen, female or male, young or aged, able or disabled who lives in the society.
2. They can indicate how values are concerned when using technology.
3. They have a notion of how technology looks like in the eyes of girls and boys at school and also of other specific groups of people using technology without special technical schooling like young children, aged people, disabled people or a local union of housewives.
4. They can carry out a little piece of research into the entrance affections, cognitions and values of these groups of people.

5. They know a number of useful strategies for teaching these varied groups and they have tried them out in an educational program.

Three main issues are illustrated and elaborated in the reader and workbook of the course:

1. The image of technology.

Technology is to invent, but also to solve problems of daily life. It is to use materials and energy, but also to keep natural resources. It is to construct an environment, but also to maintain an environment. Technology requires: genius and also perseverance, calculation and intuition, creativity and accuracy. The technological behaviors enumerated above refer to male as well as female values and it contains male as well as female qualities. Anybody male or female will benefit from personal development of these technological qualities.

2. Entrance behavior with respect to technology education.

Already very young girls and boys have different experiences through socialization and play. They develop different relevant qualities with respect to technology education before the very start of it at the age of twelve. Besides that differences in developed skills may not be under-estimated. How can the curriculum reflect these different qualities and compensate sufficiently for missing experiences.

3. Girls' and boys' daily lives.

What issues on technology and what reasons for further personal development with respect to technology do girls and boys derive from their daily life and their plans for the future? Technology teachers need to be able to do some investigations themselves among male and female students and other target groups in order to understand them and be able to discuss this with them.

The learning activities

The Australian GAMAST-project was the main source of ideas for designing this course on women and technology. The exemplary teaching materials of the McClintock Collective[8] compiled in the book "Getting into Gear" provided appropriate illustrations. For example after the first introductory meeting, the course has been continued with 'the lesson on comparing egg beaters' derived from this materials. This lesson gives an introduction to a gender inclusive way of looking at technology and presents some principles of gender-inclusive teaching. During the following meetings plenary discussions on subjects from the reader and workbook took place regularly.

The reader included introductory information on subjects, such as women and technical jobs, women before, during and after the second world war, children's play, socialization, learning in mixed or single sexed groups and technology assessment. This plenary discussions together form one stream in the course program.
The workbook provided guidlines for the other stream in the course program, which consisted of educational projects. In small groups the participants work out during the twelve weeks of the course an educational program (like a informative meeting, a sries of lessons or a video taped production) for the different target groups of their own choice. They tryed out their programs and report about their projects to the other participants in a final presentation.

Expectations and special wishes of participants concerning the course

On the occasion of the first meeting of the course the 115 participants (26 women, 88 men) answered a short questionnaire and ticked which statements, out of ten, expressed reasons why this course on women and technology can become valuable to them personally. The statements and the percentages of participants who ticked these statements are:

1. To get new examples of teaching materials for technology (77%).
2. To get new ideas about teaching methods to draw girls as well as boys into the lesson (83%).
3. To get actual information about relevant differences between girls and boys with respect to technology education (69%).
4. To get to know more about possible explanations about differences between men and women (42%).
5. To get to know more about important values and experiences of women with respect to technology (58%).
6. To learn how to carry out simple investigations into children's image of technology, their knowledge of technology and their interest with respect to technology (69%).
7. To learn about some different views on education and emancipation (43%).
8. Gain confidence to speak about gender issues with colleagues (19%).
9. Gain confidence to discuss conflicting views on gender issues (17%).
10. Other reasons why this course on women and technology can be valuable to oneself (3%).

It is interesting to look at different subgroups in the heterogeneous group of participants.

On the one side there are 12 women (10% of the total group) and 49 men (43%) with a more or less high technical background, such former technical workers in industry, technical assistants in education, former teachers of mathematics, sciences and computer science. On the other side there are 14 women (12%) and 39 men (34%) with a low technical background such as former teachers of handicraft and fine arts, sport, former teachers of primary education and former teachers of disabled children.

TABLE 1: RELATIVE SCORES ON REASONS 1 T/M 10 IN %

group (N)	1	2	3	4	5	6	7	8	9	10
all (115)	77	83	69	42	58	69	43	19	17	03
nT-w (14)	86	79	57	64	57	93	43	36	00	07
nT-m (39)	74	74	67	44	62	62	49	15	21	03
T-w (12)	92	92	67	42	58	67	67	25	25	00
T-m (49)	76	92	76	35	57	69	35	16	18	04

N = number of participants in the (sub)group
T-w/nT-w= group participants with high/low technical background, women
T-m/nT-m= group participants with high/low technical background, men

The data in this table give insight into the expectations and wishes of this actual groups and can not be generalized. But they might be indicative of relevant points of concern when teaching gender issues in teacher training.

Discussion of the data in table 1

Comparison of the data for the four subgroups reveals some striking resemblances and differences, which can be described as follows.

The women with low technical background has a relatively high need:

4. To get to know more about possible explanations about differences between men and women.
6. To learn how to carry out simple investigations into children's image of technology, their knowledge of technology and their interest with respect to technology.
8. Gain confidence to speak about gender issues with colleagues.

The women with high technical background show a little bit more confidence to speak about gender issues, but have a higher interested in different views on education and emancipation (statement 7). Besides they express the highest need:

1. To get new examples of teaching materials for technology.
2. To get new ideas about teaching methods to draw girls as well as boys into the lesson.

9. Gain confidence to discuss conflicting views on gender issues.

To a less high degree than the women, the men express a need for new teaching materials. But especially the men with a high technical background express a very high need for new ideas about teaching methods (statement 2). And a little bit more than the others they express a need:

3. To get actual information about relevant differences between girls and boys with respect to technology education.

But they express a very low need to go into possible explanations of gender differences (statement 4), different views on education and emancipation (statement 7), gain confidence to speak about gender issues with colleagues (8), or to discuss conflicting views (9).

The men with a low technical background do not express striking needs compared with the others.

An interpretation of the differences between groups of participants

For women with a low technical background entering the new profession of technology teacher seems to coincide with the need to explore by investigation and conversation the theme of people and technology and especially gender issues.

The women with a high technical background express a high need for new materials and teaching methods for technology teaching. They seem to be very discontented about what they have seen till now. Discussing gender issues seems to imply for them a confrontation of conflicting views.

Men with a high technical background seem to realize just like the women with a high technical background, that they come over from a male technical environment into a mixed gender environment, so that they have to adapt their teaching strategies to work with mixed groups of girls and boys. Most of the men in this group seem not at all to be keen of discussing gender issues in general.

The men with a low technical background seem to be the most prepared to manage the new situation of technology education with creativity and flexibility. Gender differences are not a very emergent issue, nor a very controversial issue for them.

The effect of following the course on women and technology

Conclusions on the effect of the course on women and technology can be drawn from the

participants' final reports written immediately after the course. These personal reports have been written on the basis of a checklist. These reports provided qualitative data, which have been scored and summarized into categories comparable with the content of the ten statements of the initial questionnaire.
The participants were asked to write down on one and a half page A4 what important things they have noticed and learned from the course. Additionally they were asked to make some evaluating comments on the course. They got a checklist with topics for their final reports, but they were free to go into topics only, when these were relevant to them personally. Therefore counting their answers as such is meaningless. But it is of interest to look for the variety of statements which came up and compare them with the statements of the initial questionnaire to check whether there are coming up any correspondences or new points of view for discussion.

A short summary of the most important statements in the final reports

The extended definition of technology (to construct, but also to maintain an environment etc, see page 3 of this paper, which was illustrated with the titles of SATIS-units) has been memorized in the final reports of many participants. The exemplary lesson on the egg beaters has opened their eyes for the applicability of this gender-inclusive approach of technology. Some participants discovered from this exemplary lesson the power of gender-inclusive teaching strategies to connect learning about technology with their students' experiences and feelings. The suggested ideas for teaching materials and teaching strategies have been used by participants in quit different target groups.
Investigating the needs and values with respect to technology of a chosen target group of people was found to be an instructive experience. Some of the participants only formulated questions about knowledge and opinions about products of technology. Others were able to asked questions about the implicite values and principles of people dealing with technology.
To organize an educational event in a non-familiar setting was found to be a great experience. Participants who carried out an educational project in a familiar environment have gained from the input and feedback from their fellow-participants. Some participants have invented very original subjects for teaching technology, such as "umbrella's", "design and application of zip-fasteners" and " living nearly independent as a disabled woman". Others worked out nice activities and games. The final plenary presentations of these educational projects were valued highly by everybody. Many of the participants realized that it was important but found it rather difficult to meet gender-inclusive

criteria for their educational projects. Some participants put forward that the attitude of the teacher is a more important factor than the used teaching materials. Some participants however failed completely to account in some way or another for differences between girls and boys.

The time spend during the weekly meetings on illustration and discussion of the special themes included in the accompanying reader of the course has been valued divergently by the participants. The highest appreciations were given to two articles on the observation of 'children's play' and a video taped story about a girl who want to become a pilot and who succeeded to persuade her brother, father and teacher to give her the opportunity. The most negative comments were given to a documentary TV-program "Exact, the right thing for you!", which explained the making of girls and boys by socialization in daily life, both inside and outside school, mainly because it generalized apparently accidental occurrences so rigorously.

Several participants put forward in their reports more personal and relational questions concerning their private or professional lives, which came up or became clarified. Besides that, discussions came up between participants about controversial points of view. This increased the need of some participants to have more time for a guided discussion.

Comparison with the initial questionnaire and new points of view

Many participants have gained new ideas about new teaching materials just like they expected. But less participants reported new ideas about strategies for teaching. Especially men with a high technical background have gained less new ideas about it than they expected.

Especially women and men with a low technical background go into the question of differences between girls and boys and report about values and experiences of women with respect to technology. Only a small minority of the participants has learned something about different views on education and emancipation. Several people expressed the need of more guided discussions during the course. (But others seem to benefit from not having to talk about these things to much). Some individuals reported to have acquired valuable self-knowledge and insight in their own situation as a woman or man.

Conclusions

The conclusion of this evaluation is shortly, that participants have found inspiring new ideas about teaching materials and teaching strategies. Many participants have reported also that they have, sometimes for the first time, realized themselves that differences between male and female students occur not only outside school, but also inside the classroom, and (!) can be investigated and managed in attractive ways by the teacher. Many of the participants have admit a feeling of uneasiness in the beginning of the course, because of the strong links with their own self-identity, and their social position in the group of participants. More attention is needed for the application of procedures to make it safe for each person to participate this course.

Further development

An essential element of the course is to enable the participants to teach technology and deal with gender differences in such a way that relevant male and female qualities are valued equally. Therefore a gender-inclusive definition of technology and workable ideas for teaching and are nescessary. However the participants have very different backgrounds, which have shaped their image of technology and their implicite values and principles concerning technology. To make understandable how their different perspectives on women and technology influence their power to reach gender-inclusive teaching goals, an investigation into the participants' own implicite values and goals might be helpful. This can also contribute to a safer learning environment for all participants.
It is worth to consider the benefits of a comparable course on science teaching in secondary education. It should be necessary to change the existing image of science, to examine the values associated with and exluded from it and to look for more appropriate teaching strategies just as is reported here for the case of technology education. If science teachers can be convinced of the necessity of these changes, than they can equally profit by a course on gender inclusive strategies for teaching science & technology.

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IS IT POSSIBLE TO CHANGE SCIENCE-TEACHERS' WAY OF TEACHING?

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The article will give some results of a qualitative research project dealing with changing the role of science teachers in primary schools. The aim of the project was to observe if the pupils were allowed to get the ownership of their own learning process in science lessons with a great amount of practical work.

My Ph.D.-project 1987-90 indicated that in classes where the girls took active part in the science lessons the pupils had influence on their own working situation and were allowed a certain degree of self determination.

My primary findings seem to indicate that it is not at all simple for a teacher to generate new interaction-pattern in the classroom.

Lots of Factors

It is obvious from reading the different contributions to the GASAT-meetings over the years that a lot of factors are influencing girls' participation in doing science. It is also clear that many of those factors are cross-cultural. But as we have seen from reports cultural differences may give a shift in the usual patterns about girls' participating in science education (Fensham, Klainin and West 1987). Those factors influencing girls taking active part in science lessons are not independent and are at play at the same time.

In my Ph.D.-project I followed three classes for a longer period of time. I decided to work with the classes because I knew from visits in the classroom that the girls in those classes took active part in the science lessons. With a background in observations from those classes I set up a model for the factors influencing the girls' active involvement in physics and chemistry lessons. The model is presented in fig.1 (Sørensen 1990a). The factors mentioned in the model are in action at different levels. Some of them may be changed through actions from the government and school authorities such as changing in national curriculum. Others are changed through the slow transformations in society over

Factors influencing girls´participation in science.

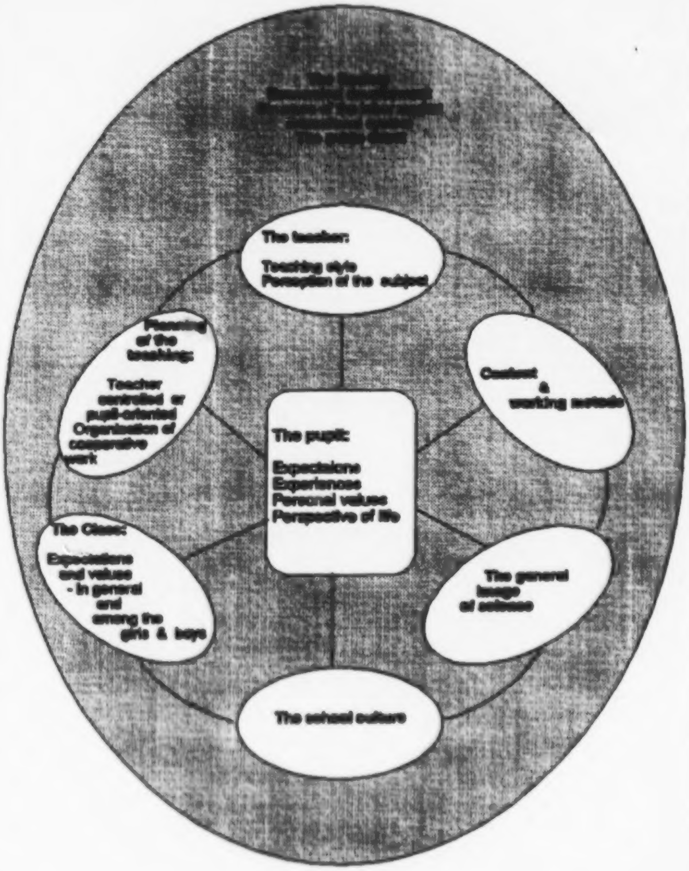
The teacher:
Teaching style
Perception of the subject
Planning of the teaching:
Teacher controlled or pupil-oriented
Organisation of cooperative work
Content & working methods
The pupil:
Expectations
Experiences
Personal values
Perspective of life
The Class:
Expectations and values
- In general and among the girls & boys
The general image of science
The school culture

Figure 1

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the years. Several of the factors define the classroom situation and the frame around the teaching for the single science teacher, and those factors cannot easily be changed by the teacher. The teacher may create changes around hers/his class, but family-expectations, peer group influence, the socio-economical situation in society and other factors out of range of the teacher's influence may lessen the outcome of changing strategies in science education. The GIST-project showed the difficulties introducing changes in established patterns (Whyte 1987).

Nevertheless the teacher has a great responsibility for creating a gender-including science education, and as seen from my model the teacher is able to influence a lot of the settings around the class and have several possibilities to create learning surroundings able to give girls optimum possibilities for learning science in a given situation. In my Ph.D.-project I found the teachers as key-persons in making gender fair science education. The teachers' attitudes, expectations and way of interacting with the students, their preferences for teacher centred or pupil oriented teaching style have a greater influence on girls' participation in science lessons than the choice of content/subjects in science.

It is a consequence from those findings it is impossible to invent the programme, to write the textbook, to make the curriculum that will once and for all change the known pattern of girls avoiding the hard sciences (Sørensen 1991).

To try to investigate the role of the teachers more closely I planned an action-project involving teachers from a school south of Copenhagen. The project received two years funding from the Danish Research Council for Humanities.

The Danish Primary School System

Before I describe the project I find it necessary to introduce the Danish primary school system (the "folkeskole") and the teacher education. In Denmark the teachers for the primary schools are educated in general education with a certain degree of specialization in 2 subjects (four years education).

In Denmark nine years of education is compulsory, from the age of seven to the age of sixteen. In the Danish primary schools the children may start at the age of six in a "kindergarten" class and they stay in one and the same school until the age of sixteen at the ninth grade. Some of the children choose to study another year at the school in the tenth grade, but the tenth grade is voluntary, while others leave school and about one third continue their education in high school. From the first grade a group of children (around 22) stay together in one "class" up until the ninth (or tenth) grade. Often the teacher in Danish language will follow the group of children from the first to the ninth grade (or tenth) with a special responsibility for the group. In the grades eight to ten the children may follow courses at two different levels in mathematics, foreign languages, and physics/chemistry.

It is common that a group of children (a class) at the first grade has two or three different teachers. It is also common that the teacher in Danish language and the teacher in mathematics follow the class up until the ninth or tenth grade. From the third grade the class may have other teachers in other subjects such as science or foreign languages, but even then those teachers follow the class during the years in which the subject is taught.

The children's education in science begins with integrated science (without physics and chemistry) in the third grade. From the fifth grade to the seventh the children follow courses in biology and geography. At the seventh grade the education in physics and chemistry starts with integrated courses in physics/chemistry two lessons a week for three years.

In Denmark natural science takes up an astonishingly small part of the curriculum. But just now the Government is planning to make changes in the school system, and it looks like the pattern will change and education in physics and chemistry will be allowed to be introduced earlier than the seventh grade, maybe at the third grade. One of those changes teachers and researchers interested in the gender questions in science have argued for in years (Sørensen 1990b).

My Project on Changing the Roles of the Teachers

My project consisted of two parts. One part was a follow up on two of the classes from the Ph.D.-project and make together with the Ph.D.-project a longitudinal study. One of those classes I followed from the sixth grade to the final examination at the end of the ninth grade. The other one I have worked with since the third grade and I shall follow the class until the final examination in June, 1993. Both classes have had physics and chemistry before the seventh grade, being as mentioned the normal grade to start.

In the other part of my project I worked with a group of teachers in science and Danish language teaching grades three to six. I have found girls more actively involved in doing science in classes with a certain degree of self-determination. Therefore I wanted to investigate whether working with pupil activities in science could persuade the teachers to let the pupils get ownership of their own learning process in science. I started the project with a short introductory course for the teachers involved. I also interviewed the teachers involved about their role as teachers, about their opinions of their pupils and their expectations towards girls and boys in the class.

Later on I worked as a consultant for the teachers who wanted to do science activities with the children. I observed in different classes for a shorter or longer period of time. I worked with three of the classes several times during the two years (grade five the first year and grade six the second). Their teachers in Danish language are used to working together. They often plan some weeks' work together -

small projects like one of the projects I was involved in, 'Chemistry in the Kitchen'. Sometimes they taught the pupils in their own class for the whole period, on other occasions they split the three classes in groups and taught a special subject to each different group.

I was a participant observer and after each period I took part in evaluations and discussions with teachers and pupils. I interviewed the teachers after each period. At the end of the two years I reinterviewed the teachers.

Before presenting results from my project about the roles of the teachers I want to resume one of the findings from the Ph.D.-project.

Findings from the Ph.D.-Project

It was an essential result of my Ph.D-project that the girls in the project classes had to feel personally involved in order to keep an interest in working with science. They had to be able to identify themselves with what they were doing and to experience a purpose, being more than just learning the subject. The purposes may have been very different, but it was determined by the perspective put on the science content. A purpose could be to learn about how you see and hear, or about what the food contains, or about phenomena in nature. But the purpose may also have been to have to present to others - parents, other adults or some children in a different class - the results of a science experiment or an investigation in science.

Such an engagement can be achieved by letting the pupils have influence on the planning of the teaching, on the choice of contents of the science subjects to be taught, on the perspectiveness of the subject. One of the most important possibilities to give the pupils influence on their learning in science takes place when evaluating the sequence together with the pupils.

Reflections on the Longitudinal Part of the Project

From the longitudinal part of my project with the two classes mentioned above I want to give a few impressions. From the last two years work with those classes the diversity among the girls have been more and more evident . The girls as a whole express that science has to make them feel personally involved in the work. But some of them reveal in interviews an interest in physics and chemistry whether it is presented in a way we may see as 'girl friendly' or in the more traditional subject centred form. They are fond of making investigations in science and feel challenged solving problems in science. They have in mind taking science courses in their further education. The majority of the girls stress that when they feel involved they like doing science, but there are other interests in their lives more important to them. Several of those girls are skilled in science. Even those girls do not consider a future doing science without being encouraged. It has been a tendency that girls showing joy in science lessons when young, talking about a future as engineers, change their expectations when they have to make their choices for the future in the ninth grade. I find that the girls restrict their own expectations and possibilities even more than can be put down to the pressure from parents and the influence from the surroundings. They become more conservative and traditional in their choices with age.

If the projects are evaluated on wether the major part of the pupils chose a scientific education, they were unsuccessful. But the girls themselves feel that they have learnt something, that they have a possibility for choosing a scientific education (perhaps later), and that they themselves made the considerations an a solid basis and then presently choose something different.

The second part of my project: `Changing the role of the teachers.'

The teachers in the second part of the project did not behave differently from their normal attitude when the pupils were to work independently with investigations.

The teacher normally very controlling reacted in the same way in this situation. The pupils felt that he controlled them and their results while working around the classroom in order to assist them.

The teacher who normally planned everything to the smallest detail and gave the pupils no freedom to express their own opinion was also very restrictive in her planning of the education and in the discussion of the results. However, the pupils were able to sense that they were within an area with which the teacher was unfamiliar, and they were happy that the teacher had to listen to them and ask them about their results.

The teacher normally allowing the pupils freedom and possibility of expressing themselves did also act in the same way when the pupils made experiments.

Both pupils as well as teachers expressed these evaluations in interviews.

The teachers are aware of their own roles as teachers. To a certain extent they express that they wish to make changes in their interactions with the pupils. It is a very sensitive subject to discuss matters so closely related to another individual´s personal appearance. My evaluation (at this stage) of the project is, that I have recognized the difficulty for a teacher in changing hers/his role of a teacher, even if she/he does have a positive wish to do so. The preconscious expectations and views on yourself as a person and as a teacher (your habitus) become a guideline for the deliberate choices one as a teacher tries to make while teaching (Bordieu 1977).

Reflections.

Setting up my last project I was inspired from the work done with meta-cognition as a help to the learner to understand and develop learning process and learning practice

(Baird and West 1986, Fensham 1989, Beyer 1992). I wanted to work together with teachers trying to let them develop their meta-cognition about their way of teaching. I wanted the teachers to let the pupils have influence on their own learning situation.

Asking the pupils' and the teachers' opinion of the outcome of the different teaching sequences you will get the answer that they have been succesful. Judging by the girls' particitation in the lessons you do not doubt the positive outcome of the research and development work, but remembering that the project was carried through before adolescence and the changing gender-role you could never tell.

Looking at the changes in the teachers' way of teaching I find too little development towards those changes I should have liked to occur.

I have mentioned the difficulties for people to change their habitus as an explanation of the small changes in the teachers' role as teachers. Another reason may be the limited time the teachers and I had to work together during the periods of science projects in those classes. Another explanation of my feeling of too little development may be due to the fact that it was my goal more than the teachers' to let the pupils get more influence in the classroom. Furthermore it may be too difficult in the Danish culture pattern to discuss problems too close to the individual teacher's personality.

Nevertheless, I want to continue the work with groups of teachers doing research on how to develop meta-cognition about teaching. I am reflecting on my own role as a researcher, on my expectations compared with the teachers' wishes for changes and on putting together a larger group of teachers with a personal need for developing new ways of teaching.

Conclusions

To create a positive learning environment for the girls in science lessons it is important to let the pupils have influence on their own learning situation. The girls want to feel involved on the personal level in the science lessons to maintain their interest in doing science. Many teachers feel a necessity to be in control of the classroom and to teach more than giving the pupils a possibility to learn. More work need to be done developing changes towards new roles allowing the teachers to present to the pupils possibilities for improvement of their role as learners.

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INVESTIGATING COLLABORATION IN PRIMARY SCIENCE CLASSROOMS: a gender perspective

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This paper reports on a small scale pilot study that was undertaken in three English primary schools in Spring 1992. The study investigated the learning behaviour of year 3 (7 to 8 year old) pupils as they worked in groups on science tasks. Of particular interest was the gender composition of these groups and whether there are particular features of group structure and task orientation which produce more effective learning for girls. The intended outcome of the pilot study is a larger scale national research project that will investigate links between children's learning in science and features of collaborative work. Evidence of such links will enable the development of teaching strategies for primary teachers that are most appropriate for their pupils of either sex.

Over the past five years we have been involved in various initiatives to produce Open University courses and packs for teachers in primary science. Throughout the production of these courses it has been clear to us that there were some issues relating to good practice in primary classrooms which would benefit from further study. The one we have chosen to investigate is the assumption that collaborative work especially in friendship groupings is a good thing. We have decided to question this assumption and embark on a three year period of research to investigate the cognitive and affective benefits children gain from learning in groups.

From the time of the Plowden report (1967), it has been suggested that classrooms should be organised into subgroups working together in some cooperative manner. It is surprising then to find that the largest systematic observation of British classrooms, the ORACLE survey (Galton, Simon and Croll, 1980) found:

> "There is no clear evidence that cooperative group work of the investigating-problem solving-discovery kind which Plowden held that all children should experience, features more than sparsely in our primary schools." p.159

What ORACLE found was that, although children were seated in small groups around tables they still usually worked on their own under the teacher's direction. The Alexander report (1991) recently recommended that the organisational strategies of whole class teaching, group work and individual teaching need to be used more flexibly. Robin Alexander commenting in the *Times Educational Supplement* on the uproar the report engendered said:

> "The question is not whether group work or subjects or topics are permissible - to argue this is the replicate the sterility of the traditional/progressive debate - but to consider when such approaches are most appropriate and how they might be most effectively used and improved."

So it is proposed that a mixture of ways of working *are* beneficial but we feel that there is a lack of a substantive research basis for these claims.

A GENDER PERSPECTIVE

In undertaking our study of grouping for science work, we are particularly interested in focusing on how gender dynamics operate within groups both between the children and between teachers and children.

Christine Howe (1990) found that setting primary children to work on science investigations in mixed ability groups promotes more effective learning than streaming children into groups where they possess similar ideas and levels of knowledge. She suggests that allocating children at random is good enough to provide these mixed ability groupings. However, gender is known to play a very important role in the interaction and engagement of pupils on science tasks. Murphy (1991) found, for example, that given the same tasks pupils pursued different variables, so allocating pupils randomly to groups may produce gender distributions that do not promote effective learning for all members of the group.

Kempa (1991) and others have found that in order to provide a favourable environment for active participation of girls in science tasks, a critical mass of girls in the group may be necessary. A single girl in a group with 2 or 3 boys is quite likely to get 'left out' of the group activity. (This corresponds to the findings of Licht and Dweck (1983) about girls learned helplessness.) As a non-participant such a girl is unlikely to benefit from the interaction between the other group members. ('Silent' members of the group according to Kempa however, can be participants and gain education benefit from being part of the group.)

Parker and Reneé (1986) showed that where teachers' awareness of gender issues is poor, girls are at a disadvantage in group work in mixed sex groupings. Whilst for those teachers do who appreciate gender issues, mixed sex groups exhibit the same learning behaviour and involvement in science tasks as single sex groups.

In summary then, current research indicates links between gender differences in:

- childrens' cognitive response to science investigations, i.e. the variables they consider relevant and the solutions the judge appropriate (Murphy, 1991)
- childrens' affective response to science tasks, for example girls' learned helplessness (Licht and Dweck, 1983 and Smail and Kelly, 1984)
- childrens' involvement in problem solving in groups leading to achievement (Kempa, 1991)
- teachers' response to mixed groups according to the teachers' own awareness of gender issues (Parker and Renee, 1986).

THE PILOT STUDY

Aims

The pilot study was carried out to gather information to help us in the design of the main research programme. We were concerned to explore:

- the selection of science tasks to investigate,
- ways of grouping pupils,
- aspects of collaboration worth pursuing,
- presentation and administration of tasks to enhance collaboration,
- resourcing of tasks,
- data collection methods,
- data analysis.

We set out to investigate two types of collaboration. Firstly, collaboration amongst pupils engaged in some formal, set tasks using established

- methodology designed by the Assessment of Performance Unit in science (APU) and secondly, pupils undertaking 'authentic' tasks that were contextualised within the pupils' present learning.

Methodology

The 'formal' task

This task was based on an established APU investigation. APU methodology was used because APU research (which preceded the development of the National Curriculum [NC] in England, Wales and Northern Ireland,) was based on tasks similar to those represented in NC attainment target 1 - scientific investigation. (With the advent of the NC there is now a statutory requirement for teachers to teach and assess practical investigative abilities.) The APU research showed that children performed at a higher level when in a practical situation because of the direct feedback they received about the consequences of their actions and the decision making (Russell et al., 1988). When the pupils were allowed to work together in pairs in a practical context, and to talk through their strategies together, their performance was further elevated. (Whyte, 1988).

The task required the children to test different sorts of papers to find out which one would the best for covering a book. The children were given samples of 4 different types of paper - brown paper (such as that used for wrapping parcels), wallpaper, writing paper and sugar paper. They were also supplied with items to test the various dimensions of the papers' durability. These were - sandpaper, a stone, erasers, scissors, water and a water dropper. This task was set out in a standard way by the teacher/researcher and the children were then left to discuss and carry out the investigation.

The 'authentic' task

This task developed from classwork that the children were currently doing. The class topic was set around one of their reading books and the science focus of the topic was sound. Sound was also chosen because we were concerned to focus on a concept area where complementary research was already available. Children's understanding of sound has been explored by the primary SPACE project (Watt and Russell, 1990) The first stage of the study was to elicit the childrens' ideas about sound and then to discuss these ideas with them. The teacher/researcher (herself a very experienced primary teacher and science specialist) then spent three mornings, at weekly intervals, working with the group of four pupils. Her brief was to guide the pupils in their investigation, but to let the pupils determine which aspects of sound were to be investigated so that the investigation evolved in a more naturalistic way.

The data for the study was collected by video and audio recordings of all the groups as they worked. The tapes were transcribed for detailed analysis. The pupils' written report of their investigations is also available and the teacher/researcher compiled a report of her observations. The video recordings provided the most detailed data for our analysis.

The schools

School A was selected for the formal task. It is a large 5-13 age group school in a middle class area. In year 3 the children normally do science as a whole class, working in groups on the same aspect of a topic, but at different levels. The children are used to investigating to find answers to open-ended questions, however teacher support in the form of a structured plan or discussion of the next steps in an experiment are usually provided. This was therefore the first time that the pupils were asked to carry out an investigation without their usual level of support. Three groups were established. These were:

Group 1 -a group of 4 boys ;Group 2 - a group of 4 girls and Group 3 - a group of 2 boys and 2 girls. The teacher selected the pupils in each group on the basis that most of them were already used to working together.

The 'authentic' task was administered in School B. This school is a First (5-8 year old) School and has 7 classes. It is located in a mixed social class area. Three boys and one girl were chosen to participate in this part of the study. The group of four was chosen by the class teacher because she felt that they would work well together and that within this grouping each child would benefit from the others in different ways.

The investigations - some findings

The 'formal' task

Group 1 (Boys only)

First test - rough edge test

The teacher/researcher presented the independent variable (type of paper) to the children who proceeded to select each sample of paper and test it sequentially. The children had a global concept of the dependant variable (ie 'proofness' of the paper against action by water, rubbing, cutting, tearing, impact) and operationalised this in a variety of ways. The first test was how well the paper withstood or was proof against a rough edge. The rough edges identified were sandpaper, ink erasers and a rock. They defined the dependant variable for each by the amount of paper removed, whether the paper was marked or not marked and size of dent on the paper.

They did not control any variable at this point (ie pressure, height stone dropped etc.) They tested systematically for example by drawing the sandpaper across the complete surface - both sides for each sample. Their overall strategy was to eliminate the samples using a pass/fail qualitative judgement. They used this strategy to reduce the samples to two and then used the 'rock test' to decide the best between these (ie the one that dents the least).

Second test - 'waterproofness'

The children disagreed about how to judge waterproofness (again the judgement was qualitative). Three boys settled for whether they can feel water coming through whereas one boy was concerned with staining. They again were not concerned with *degrees* of waterproofness, just if the paper passed or failed. They did not control the amount of water and at one point one boy suggested that not enough was being used (this was not a control variable, but deciding the minimum amount needed to judge an effect was an important procedural decision). In the next test without negotiation, the same boy noticeably added a lot more water. Another boy informed the others that the way to make it a fair test was to leave the water on for the same length of time and they agree on one minute. The first boy mentioned the need to fix a zero point and now the group all agreed on how to judge 'waterproofness'. The first boy again commented on the absorbency of the paper and the effect of thickness on this.

Third test - strength of paper

The children did not really conceptualise how the strength of the paper is related to the ease with which it can be ripped. They realised that the paper should not rip but could not translate this into an abstract variable such as strength. They considered timing how long it takes the paper samples to rip but did not get far with this. They went onto investigate how much each sample bent and then made judgements on degrees of bend.

Group 2 (Girls only)

This group interacted quite differently with the teacher/researcher than with each other. They didn't seem to understand the investigation because they saw the problem under investigation as the teacher/researcher's problem not theirs. They therefore did not perform as well as the boys because:

(i) Although they were better at articulating fair test procedures, they did not then use them.

(ii) The girls needed an audience for their work.

(iii) Their prior ideas about which of the samples were best were not exposed or challenged so that the function of the book covering and aesthetics dominated the more abstract properties they were expected to investigate.

(iv) The girls did have some good ideas but these again were not picked up or even dismissed with a gentle laugh. (This did not happen with the boys).

Interestingly the girls carried out a test of waterproofing and combined this with other tests. This is a characteristic response of girls but it appears thoughtless. The girls tested their samples simultaneously which enabled a direct comparison to be made, however in practice there was next to no control of variables .

The girls were very concerned about the recording of their results and who should do it. If the girls had been asked to *write* a response rather than *do* the investigation they would have performed better than the boys. As it was they got nowhere with the investigation.

Group 3 (Mixed sex)

Initially collaboration appeared to be developing fruitfully here, but technical problems intervened which led to the group being disturbed. At one point the teacher/researcher said "you are getting nearer" which was effectively asking the children to guess what she was thinking. Also the teacher/researcher's strategy of prioritizing recording of results seemed to hinder some potential collaboration.

Analysis

There is a marked difference between the two single sex groups and the outcome of the investigation. Both groups appear to collaborate and the boys' collaboration appears to aid their progress significantly. The boys all offered individual contributions but different roles were clearly established and accepted early on. The girls are 'on-task' for the investigation, but easily lost sight of what they are testing and why. Aesthetic qualities of the paper and its suitability for writing on take over from the paper's durability as the focus of the investigation. The girls also get sidetracked by discussions of who should record the results and what should be recorded and this takes precious time away from the investigation. If the girls had been assessed on their written results or on the quality of the paper as a book covering from its aesthetic point of view, then they would have achieved at a higher level than the boys. There is also little evidence to show that these girls had collaborated before and they were relatively hostile to each other which was not helped by overt interaction with the teacher/researcher.

The 'authentic' tasks

These tasks took place over three sessions with the same group of 4 pupils (3 boys and a girl).

Week 1

After an initial discussion with their class teacher about how sound travels and what can block out sound, the class teacher left and the group remained with the teacher/researcher. The children devised a preliminary investigation to find out what will block out the sound from a transistor radio. They tried to block out the sound by covering the radio with several materials in a fairly haphazard way. The teacher/researcher tried to suggest some structure to their investigation which involved distance as well as covering materials.

Week 2

The investigation carried on from the previous week - this time using bubble plastic as the wrapping material for the radio and testing how many layers of bubble plastic are needed to block out the sound. The teacher/ researcher then suggested using a ticking clock as the sound source and the group investigated wrapping it up and placing it on a cushion before measuring how far away they have to be to no longer hear the sound. They recorded their results in a table and later, in between weeks 2 and 3, drew some bar charts of their results.

Week 3

The teacher/researcher asked the group to consider animals' ears and how they differ from humans' ears. The group decided that some animals can change the shape of their ears in order to hear more easily and this led the children to make 'ear trumpets' to fit onto their ears in order to catch sounds more easily. Each child set about the task of making the ear trumpets individually, and the three boys talked excitedly about the project whilst experimenting with the cardboard tubes with each other, whilst the girl worked on her own. The teacher/researcher suggested that they work in two's and so the two white boys worked together, but the black boy and the girl worked on their own. The two white boys worked collaboratively and make a very large, effective ear trumpet with various attachments/handles etc. The black boy was very unsure of how to enhance the straight cardboard tube, with ear cups, in order to make it more effective as an ear trumpet and the girl decorated the straight cardboard tube and put a cup at one end. Both these children worked individually with no discussion with anyone else. The teacher/researcher suggested that they test the ear trumpets by listening to each other and to her whisper a phrase with and without the trumpets against each child's ear.

Analysis

In these more open-ended tasks, the nature of the task is vital in encouraging an atmosphere that is conducive to collaborative working.

Even though many of the activities were suitable for collaboration, it did not occur as frequently as it might have. When it did occur it most often excluded the girl and sometimes also excluded the black boy. Again the girl was anxious to help the teacher/researcher and exhibited characteristics which can hinder pupils' progress in science investigations by looking for the answer that she thought the teacher/researcher wanted rather than investigating from her own ideas. She also paid more attention to the decorative properties of her ear trumpet than to its effectiveness for collecting sound.

Critical gendered instances

Much has been written about girls' response to science at school both at primary and secondary level. Some strategies have been developed to encourage girls and some have been taken up. Some parts of the jigsaw are now in place. The pilot study outlined above demonstrated many of the features that have been well documented when examining girls' and teachers' responses to science learning at primary school. The following examples illustrate this:

Formal task (School A)

Boys' group

- *Boys use their watches to time water coming through the paper. This corresponds well with international findings of boys greater use of measuring instruments like stopwatches and the likelihood that they have more experience of them outside school.*

Girls' group

- *Girls have very good ideas about fair test procedures but do not have anyone to present them to. These ideas are not followed through in the investigation.*
- *Girl choses the paper to test on the basis of its colour.*
- *Teacher/researcher laughs at girl's suggestions to test the paper by seeing how it burns and also to have a second piece of paper as a control to see how much water has come through.*
- *Girl stopped from speaking by teacher/researcher on occasion and her ideas not followed up later.*
- *Girls trying to guess what the teacher/researcher wants (to please her).*

Authentic task (School B)

- *Girl always puts up her hand to answer questions and is very ready to answer questions. Boys never raise hands. Girl first to volunteer to do things and to record results. Girl often gets ignored by teacher/researcher and sometimes the boys 'switch off' when girl is talking.*
- *The three boys unwrap the radio and won't let the girl take part. Instead of insisting that the boys let the girl in, the teacher/researcher offers the girl a consolation prize - taking the tape off the volume control.*
- *Boys disparaging towards girl; boy makes fun of girl decorating her tube (says" she's stickervating hers") so girl decides that she's put the frilly bits on the tube to cover up some holes; boys ridicule girl by saying she's carrying the radio as if its a cat and cuddling it.*
- *Boy takes girl's scissors and later when he needs them again goes to look for them on her table despite the fact he hasn't returned them to her.*
- *Girl lets a boy test her tube before she does so herself. Boys test their own first.*
- *Girl addresses her discussion of her ear trumpet to another boy in the group rather than teacher/researcher. Girl's behaviour is disparaging towards her own work.*

Conclusion

What does all this mean for collaborative group working - the major subject of our study? What hypotheses can be drawn from our observations that can be investigated by the larger-scale research project? What are the challenges for the research programme revealed by the pilot study? If collaborative working is a good thing, how do we encourage collaborative working and ensure that girls don't get marginalised?

POSSIBLE HYPOTHESES AND CHALLENGES

- A single girl in a mixed sex group will end up working on her own.
- Girls' enthusiasm and skill in writing gets in the way of collaboration.
- Girls' perception of the aesthetic qualities in an investigation obscure/confuse the ultimate goal of the investigation.
- Boys find it easier than girls to collaborate in groups in a mixed sex grouping.

- Single girls in a mixed sex group suffer more 'put-downs' from boys (leading to an undermining of their confidence).
- Girls' desire to 'please Miss' gets in the way of effective collaboration
- they are looking for the teacher's agenda, not their own.
- Girls need an audience to provide information/results for.
- Boys are more comfortable with measuring instruments

A quotation we like that seems to encapsulate much of our opinion is the following:

> "Early socialisation of girls and boys seems to produce a situation where boys find it easier to handle the teaching and learning styles frequently employed in primary science, particularly group work and open-ended discussion. Recognition of this will allow us to plan teaching strategies which actively encourage girls to participate more fully in groups and discuss their ideas freely ...Development of science skills (observing leading to hypothesis formulation, cooperative working, experimenting and predicting) are ones in which girls can experience particular problems. Often a level of confidence in putting forward ideas and participating in group discussions is required. Girls find active participation difficult, boys are more assertive.". (Morgan, 1989)

The pilot study has presented us with several challenges that we must face in the design of our research programme. Some of these challenges are:

•Definition of the task for the investigation
We found that with the more open-ended, 'authentic' task it was much more difficult to create an atmosphere that would encourage collaboration, so we must structure the chosen task more carefully along the lines of the 'formal' task studied in the pilot.

•Understanding of the task by pupils
In both the 'formal' and the 'authentic' tasks, the girls became sidetracked by issues not central to the investigation. We must ensure that the nature of the task is grasped by the girl's as well as the boy's *throughout* the investigation.

•Establishing the groups

Whilst it seemed that some groups, or pairs within a group, worked well together, others did not. In the main study must ensure that groups are established that have a good record of working well together.

•Role of teacher/researcher

This role is vital and a very fine line has to be drawn between offering necessary guidance and too much intervention. In the main study it is our job to give the teacher/researcher careful guidance on places at which intervention is required and how much leeway she can allow the pupils to proceed down their own avenues for investigation.

This was a small-scale pilot study and we do not aim to draw definitive conclusions from this work. This pilot study has provided a very rich source on which to base a larger-scale research project on collaborative working in science with primary school children that pays particular attention to gender dynamics as a core factor for determining effective collaboration as a stimulus to affective and also cognitive learning. This study has raised a lot of questions and challenges for us that we need to address. However it is evident from the pilot study that not all tasks are suitable for collaborative working and how the the group is managed by both the participants and the teacher is a key factor. As Kempa points out "Teachers themselves have to assume responsibility for the development of 'management skills' in pupils and be prepared to facilitate group work by appropriate task analysis and task structuring" Kempa (1991).

We hope to find in the course of our research some information that will help us do this.

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I REFLECTIONS ON GASAT WORK IN THE FIELD OF EDUCATION AND SCHOOLING

3 Students, lecturers and teaching methods in male dominated university contexts

The Use of Bilateral Relationships to promote Curriculum Development For Girls' Vocational Schools in Turkish Speaking Eastern European Countries

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Should educational programs be exclusive stressing national identity rather than group differences, or should these differences among intercultural communities be utilized to broaden and enrich the resources? The argument that these issues raise will be explored and discussed to see to what extent the exchange of ideas in educational matters can assist the women in these communities to attain autonomous roles. Turkey is now on the threshold of new era as she broadens her relationships with Eastern European countries in the democratizing process concerning both sides. Turkey is aware that today's pluralistic multiculturalism calls forth a re-assesment of educational matters which must be up to date in regard to industrial and technological developments. Girls' Vocational schools can lend themselves to possible inqruiry and investigation since their curricula are, to a large extent, related to industry that requires skilled semiprofessionals. These schools also display the ethnic characteristics and cultural preferences of their own localities.Through bilateral relationships new strategies and ways of interaction among communities can best be initiated and adapted by young women; through the exchange of ideas new perspectives that will benefit all Girls' Vocational schools can be metertalized.

The task of organizing instructional material into logical and effective teaching is even more important today than before. Technological changes are continuing to exert tremendeous influences on the social, economic and political structure of the world. If the instructions are to be dynamic and meet the needs and challanges of the future, every precaution must be taken to keep the curricula up-to -date. Irrelevant and outmoded meterials, inefficient teaching are hazardous to educational structure. Thus, an educational plan may be defined as any learning environment where in adequate experiences are provided to encourage pupils' abilities. This means that not anly the young men but also young women must be given the equal opportunity to participate in educative activities that will enable them to become successful participants in a democratic society.

Before analyzing these issues and discussing to what extend the exchange o ideas in educational matters can assist the young women in these communities to become successful members of a democretic society and to attain independent and autonomous roles, definitions of "General Education" and "Vocational Education" should be made.

In its broadest sense, general education includes all the curricular and extracurricular activities offered by a school system which are designed to develop functional understandings of essential elements in life. "Industrial arts" and "Practical arts" are the segments of the general education.

"Vocational Education", on the other hand, is a generic term ebracing all the experiences an individual needs to prepare for some useful occupation. The purpose of vocational education is to provide training to develop skills, abilities, understandings, attitudes, working habits, and appreciatinons, and to impart knowledge and information needed by workers to enter and make progress in employment on a useful and productive basis.

Although the term vocational education has no limits as to types of occupations, it generally excludes the professions. It is used here to apply specifically to useful employment in trades and industry, agriculture homemaking, technical, and business areas.

We are now on the threshold of a new are. Now that cold war is over. It was won not by the strength of arms or skills of diplomats, but by virtue of the power of democratic ideas that has begun to shape a substantial portion of non European, non Anglo-American world. re-democratizing process is gaining strong footholds in domestic matters of so-called Eastern European countries.

After this recent transition, the civil society with economically diversified yet culturally, ethnically, and nationally homogeneous attitutes which are tolerant to multicultaral ways has gained importance. One of the objectivies of this kind of society will naturally be a good educational program of industry and business for people with higher educational standars, goals for greater framework. Turkey examplifies this transition.

Turkey's integration with former Soviet Union States namely Azerbeycan, Özbekistan, Kazakistan and Türkmenistan and the other Turkish speaking communities in the Balkans and Eastern-European communities in the Balkans is now in the agenda of Turkish Foreign Affairs. While Turkey is working through bilateral talks with so-called communities for cultural economic and technical colaborations, her long term commitment to the membership of European Economic community and the development of Black Sea Economic Treaty has been continuining.

As a result of these efforts and developments, and due to the basic features of ther national mould, that is her being a secular and democratic country with Muslim population in majority and her long-established secular educational programs, Turkey has now gained an adventageous and prestigious position among the Eastern European and ex Soviet-Union countries. Although, quotas, after long negotiations for exchange programs among the university students on graduate and undergraduate levels have been determined, no step in relation to vocational education has been taken so far.

I believe that new startegies and ways of interacting among the communities through exchange of ideas and the processes of contrast, debates, and active transformation to realize new perspectives that will be beneficial for the Girls' vocational schools, can easily be introduced. But, before discussing these, let's have a brief glance to the present situation of Girls' Vocational schools in Turkey and in two or three sample countries from East European and former Soviet Union communities.

In most of the Technical or Vocational Schools in Turkey (the terms are used interchangeably) which amounts to 1563, the courses are given on term basis which is 19 weeks altogether. In 37 of these schools, courses are taught in English and German. Students enroll to these schools after the completion of middle schools (8 grade). The students who complete their education in one of these high schools they acquire the title of "technician".

Type of School	**Term**	**Number of Programs**	**Prequired Credits for Graduation**
Vocational High Schools	8	27	186
Technical High Schools	8	4	227
Voca. High Sch. (Eng. and German)	8	20	220
Tech. High Sch. (Eng. and German)	10	5	259

As it is seen from above given numbers, the number of programs offered in Girls' technical schools are limited to 4 and 5. The reason for this, section like "Electronics"

"Chemistry" "Mechanics" "Computer programing" have been considered as besicly mens' occupations. whereas programs like "Office management and Secreterial Training", "Food Technology and Catering" "Glass Work", "Child Care", "Decorative Arts", "Leather Garment Making", "Tailoring", "Home Management", "Graphics", "Textile Design and Weaving Work", "Bookcare and Bookbinding", "Fashion Design", "Hotel management", "Structural Drawing" sections seem to be fully developed. In all of these programs general courses are "Turkish Language an Literature", "History", "Mathematics", "Science", "Foreign Language" and "Physical education". Vocational courses change according to the main program offered. For example :

Sample Program

Vocational Program	**Title of Courses**
Textile Weaving	fabric analysis, desings for weaving, technique data for production, use of automatic looms maintanence of machinens

These students on their graduation, can work as technical personal within the textile industry in the areas such as:

-The physical and chemical laboratories

-The semi-processing and manufacturing units of the spinning mills

As it is seen from the rough demografic outline of the set programs approved by the Ministery of Education, two important features and goals of vocational schools have been neglected. One of them is the most important characteristics of industrial arts and vocational education courses which provide experiences and skills to be mastered through rightly designated projects. Above given curricula doesn't include credit for student projects which are the indispensable means of puting theory into practice. Secondly, technical developments call for much more manipulative and technical training and experience on the areas such as "instalments of the machinary", "Matal and Woodcraft", "Automative Section" and many others which are significantly related to the industry.

In all of the former Soviet Union countries, namely Azerbeycan, Özbekistan, Kazakistan, as a result of Long-established communist system, changes in prevelant educational policies have not been made. That is to say, in these countries, same model curricula for girls Vocational schools have been applied to the Girls' vocational schools whose main segments seem to be developed for specific occupational preparation as well as for the exploration of industrial activities. These are "Girls' Vocational Schools for pre-School Education", "Girls Vocational Schools for Medical Care", "Girls Vocational Schools for Clothing". All of these schools offer a professional occupation after 11 years of formal education. Entrance exams for these schools are required.

Vocational Schools for "Pre-School Education" have been mainly desingnated for the training in three areas: Subervisors for Childrens' Playing Grounds, Teachers for Kindergartens, Subervisors and Student Advisors in Girls' Boarding Schools. Theoric and practical training require certificates in Methodology Childrens' Psychology alongside with courses in science and Russian Language and Literature.

"Girls' Vocational Schools for Medical Care" concern themselves for the training of Nurses, Midwives Specialitst in Gynecological treatment, First-aid, hospital and clinical administration and care. To become a specialiast in programs like gynecological education, candidates spend a year as interns in the hospitals and public Health Centers. In above-mentioned main diciplines, required courses are Biology, Anatomy, Chemistry and Math. Others are arranged according to the requirements of the professions they are trained for.

Girls' Vocational Schools for Clothing can also be named as industrial art schools since one of their objectives is to familiarize students with the tools, products, processes and occupations of the related clothing industry as well as the social and economic phenomena of its technology. To meet the demands of the training, based on extensive use of materials like fabrics, ornamentation and the like, the students are asked to pay for a portion of supplies they use and the materials expended; they are also required to pay tuition fee once when they enroll the school after they take an entrence exam to test their abilities.

The duration of education changes from a year or four years. The first half of the first year is devoted to theoric education. Its a kind of refreshing of their knowledge they acquired in general education. They're also taught how to operate basic tools and machines. Practical training begins in the second half of the second year. They're directed to meet the demand of clothing industry rather than creative fashion designing. Main sections are lingerie, shirt and slack manufacturing, dress making, coat making and Leather Clothing and fur making. Two times in a week, students are asked to work in the related sections of the clothing factory. At the end of every year the students can get a certificate to go into the industry. More years of training they have they are more eligiable for better positions. Those who are able to pass the exams and finish four years of education acquire a diploma and are classified as first rate tailors. After graduation, they find positions in prestigioues tailoring firms or places of the same profile.

General characteristics of Girld' Vocational Schools in former Soviet Union countries can be illustrated as follows:

Type of School	**Duration**	**Number of Programs**	**Required Credits for Graduation**
Vocational School for Pre-School Education	4 Yrs.	5	140
Vocational School for Medical Training	4 Yrs.	6	178
Vocational Schools for Clothing	1-4 Yrs.	4	162

After a brief survey of programs, one striking similarity has been found which is a lack of concern to promote the students to select projects which will introduce them to the basic concepts of industrial arts and technology and provide for them realistic experiences. When selecting projects the students should be directed according to following perspectives:

1) It must incoporate operations to be taught, 2) It must be of interest to the student, 3) It must possess utility value, 4) It must be within the student's ability to accomplish, 5) It must be well designed and completed within a reasonable time limit.

Another corresponding aspect of both programs arises from the general structures of educational philosophies which display lack of concern for the multicultural issues and regional differences which can enrich the programs. Both philosophies stress state regulation and control regardless of the diversity of cultural backgrounds. This inflexibility is a serious drawback especially for ex-Soviet Union countries even though pre-dominant aspect of their formations, such as their language and religion are the same. For Turkey, exclusion of ethnical and regional differences from the curricula does not pose a serious problem except for the colorfulness these differences would have given.

However, if Turkey is on the threshold of new developments with her neighbouring countries, she cannot disregard the mainstream of today's pluralistic multiculturalism which calls forth a re-assesment of these factors.

Before discussing the guidelines, which will form the basics of the exchange of ideas between the concerning sides, and Suggesting the best ways to help develop new strategies to promote womens' vocational education according to the new perspectives, let us have a brief glance to what an ideal outline for modern and purposeful vocational program should provide for:

1- Activities in as many industries as school shops and laboraties will permit.

2- Use of typical and important industrial tools.

3- Experience in production methods.

4- Acquaintance with the organizations and operations of industrial and commercial enterprisses.

5- Practice in identifying the more important methods employed by industry.

6- Interpretation of sources, principles and applications of power, such as stream, water, internal combustion, and electricity.

7- Study of materials from source to completed objects.

8- Study of vocational opportunities, living conditions, renumeration of workers contraversial questions pertaining to capital, labor and technology.

Within this framework of general prospectives let us see what can be done for exchanging of ideas in possible bileteral relationships:

a- A separate commission selected by the members of state offices of both sides whose main interest center around vocational schools should be set up through bilateral talks.

b- Delegates and groups of teachers and administrators of Vocational schools chosen by the commission might pay visits to so-called countries and work on the possible mutual agreements with regard to programs.

c) After revisions of the programs of bothsides, further steps for possible reformations which will be beneficial for the development of the vocational schools and the elevation of their educational aims to the standards of contemporary democratic, pluralistic societies must be taken. For example, the general outlook of the programs in ex Soviet Union Turkich Republics indicate that they are confined to three main areas of catagories of training specified for a state oriented purpose, whereas, programs in Turkey present more branches and areas of interest.

Hence, inspite of their greater number they fail specialization and more intensive program of studies. Thus, both sides can gain more information and competence through a sound analysis of their programs.

d- Present programs lack extra-curricular activities which promote students enthusiasm. Foundation of clubs like Athletics, Instrumental and Choir Music, Drama, Painting, Journalism help develop competitive gatherings not on the national but also on the international scales.

e- Wide spread exibitions of the handcrafts and the products especially reflecting the local coloring and cultural highlights will bring about an interest in the ethnic and regional characteristics and cultural preferences of their own localities.

f- The last and foremost important aspect of exchanging ideas in educational matters lies in the foundation of students exchange programs in between Turkey and so called Eastern European countries.

In conclusion, although the present curricula of both sides do not represent an ideal frame-work displaying what are expected from pedagogically and functionally well established institutions, the corresponding philosophies of these schools are well-grounded. That is to say, they are founded to train young women for semiprofessional functions. When these young women are better equipped for employment in trades and industrial pursuits as their countries go into democratizing process they not only gain their economic freedoms but also contribute to the well-being of this process.

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WOMEN UNIVERSITY LECTURERS IN THE EYES OF THEIR STUDENTS. HYPOTHESES AND SOCIO-CULTURAL PREREQUISITES IN BULGARIAN EXPERIENCE

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I. WOMEN IN BULGARIAN SCIENCE - SOCIO-CULTURAL PREREQUISITES

1. One of the main theses of socialist ideology states that men and women are equal. This thesis is a logical consequence of the leading socialist idea of social equalty. The point I am interested in, is that in the socialist society, on on ideological level, the principle of equality between men and women was presumed.

2. This socialist principle was accepted by the mass consciousness in Bulgaria. The reason for this easy acceptance was the specific for the Bulgarian society attitude towards women. The Bulgarian type of society before the socialist revolution can be characterized more correctly as a traditional than as a bourgeous one. Although the traditional society can be defined as a paternalist, it does not underestimate women, as far as they actively participate in the social life. As in this type of society there is no differentiation of public and private zones of life, women were engaged both with the agrarian and domestic work, so practically they were the dominant figure in the household. When analyzing Bulgrian folklore and literature, we can conclude that the mother or the grandmother is the one who most often takes the important family decisions, although that the formal head of the family is the father. So, my second thesis is that traditional culture in Bulgaria may be defined as a feminine one.

3. Because of above mentioned considerations after the socialist revolution in Bulgaria there was a real womens' expansion in all the spheres of public life. A conviction that they are no female and male professions was formed. Many

normative and technological regulations were initiated concerning the defence of womens' equal rights and stimulating the female active participation in social life. For instance an obligatory percentage level of participation for women in the Communist party, in different social organizations, in ruling bodies etc. was introduced.

4. The education was not an exception. For instance in most of the Universities' and outstanding colleges' subjects an equal percentage target for female and male students was introduced. The ambitions of girls towards higher education and qualified labour were stimulated.

5. This politics to stimulate womens' performance affected even the sphere of science, by traditon dominated by men. Although that it wasn't possible to introduce any percentage requirements for female participation in science, there also started a process of feminization. This processs affected both research institutes and universities, but it progressed differently for different sciences. The following data prove these statements:

SCIENCES 1970

	Number of scientists	from them women	% of women
Total number of scientist	12765	3426	26.8
IN:			
Technical science	4072	808	19.8
Medicine	2146	650	30.3
Natural science	2127	770	36.2
Agrarian science	1739	323	18.6
Social sciences	2632	858	32.6

SCIENCE 1990

	Number of scientists	from them women	% of women
Total number of scientists	31704	12523	39.5
IN:			
Technical science	12905	3820	29.6
Medicine	4573	2236	48.9
Natural science	5459	2291	42
Agrarian science	2089	683	32.7
Social sciences	6678	3493	49

The data shows that over the period of 20 years the number of scientists increased 2.5 times, while the increase in number of women in science is higher - 3.7 times. Alsmost equal proportions of men and women are reached in medicine and social sciences. In the scheme below a more detailed data on the situation in social sciences is presented.

SOCIAL SCIENCES 1990

	Number of scientists	From them women	% of women
Total number of	6678	3493	49
IN:			
Philosophy	545	225	41.3
Sociology and political science	207	96	46.4
Economics and management	1629	726	44.6
History	510	233	45.7
Philology	1709	1259	73.3
Law	201	79	39.3
Psychology	134	64	47.8
Pedagogics	788	338	42.9
Art	794	387	48.7
Wissenchaftslehre (these data are from 1989)	68	41	60.3
Scientific information	161	93	57.8

As we see philology is dominated by women, as well as wissenchaftslehre and scientific information, while the law still remains a male profession.

6. The tendency for increasing of womens' participation in science does not mean that they become dominant figures. The dominant figure in science and academic circles still remains the man. Men in science possess as a whole higher scientific status. The scheme on the next page represents distribution of scientists according to their scientific status:

SCIENTIFIC STATUS	1990		
	Number	From them women	% of women
Total number of all scientists	31704	12523	39.5
Academicians	50	-	0
Corresponding members	50	1	2
Professors	1120	129	11.5
Associate professors	2971	707	23.8
Senior research associates	4381	1249	28.5
/working in research institutes/			
Lecturers	1342	860	64
/without scientific degree/			
Assistant professors	7536	3391	45
Research associates	14254	6186	43.4

It is not suprising then that the scientist usually is associated with a man by the mass consciousness, while women-scientists are labeled as "scientific workers" or "research-assistants". A survey, carried out among college students in 1985, concerning the notion of scientists, supported the idea that the scientist is perceived as man. His main characteristics were loneliness, concentration in his scientific work, deepness of thought, patience, steadiness, clearness of purpose and so on. /see Boyadgieva P., Petkova K., Boyadgiev Tz., 1987, The Image of the Scientist, Sofia, Nauka i izkustvo/. This image is an expression of cultural attitudes toward science, reflecting the historical development of science as a male profession as well as the cultural model of modern science, based on the activistic causal male principles /See Keller Fox Evelyn, 1985, Reflections on Gender and Science, Yale University Press/.

7. At the same time, after the socialist revolution, the leading figure in Bulgarian schools and colleges turned to be the woman, due to the almost entire feminization of teachers' profession. So, while the scientist is usually associated with a man by mass consciousness, the teacher is associated with a woman. This corresponds to the mentioned above attitued towards Bulgarian woman as the leading figure in the family, hence perceived as the most important socializing factor, too.

II. WOMEN UNIVERSITY LECTURERS IN THE EYES OF THEIR STUDENTS - SOME PRELIMINARY HTPOTHESES.

From the above mentioned theses it seems that the figure of the woman-university lecturer appears as an interesting one for sociological study. The already stated theses gain importance as they describe the socio-cultural background under which the woman-lecturer acts.

To stydy this figure, the Bulgarian Association of University Women decided to make a survey among the students about their attitudes towards women - academic lecturers, that is, towards women, engaged with professional scientific work. The survey includes a sample of students, studying in all Sofia Universities and the method used is inquiry. As far as the survey is under progress the results only from the test survey have been analyzed. In the test survey participated 42 students from Sofia University, University of National and World Economics an The Academy of Art. 28 Of the respondents were men, 14 - women.

The main purpose of this survey is to check out what are the leading factors in constructing the students' image of their university lecturers and in particular of women-lecturers. The survey is designed to answer the following questions:

Is the image of the academic lecturer influenced by some gender biases or is it universal for both male and female lecturers, including only their professional qualities?

Can any compatibility be found between the ideal image of the lecturer-man and woman and the ideal image of men and women as general?

Do any specific advantages or disadvantages in their status of lecturers could be estimated as due to their gender?

How the students estimate their own lecturers-men and women?

Do the students find normal for a woman to be a prominent scientist or only in some exceptional cases?

It is important to see how all these attitudes correlate with students' notions for the role of the woman in the entire social life, with gender of the respondents, with specific distribution of power in their parents' family, with the subject they study.

Having in mind that this is a soiological study, not a psychological test, it is obvious that the expressed attitudes may be entirely different from the unconscious feelings for all these topics. But the conscious image of women-lecturers reveals to what extent all those enlisted above socio-cultural prerequisites really work and are significant in every day reasoning and esteems.

Let us now summarize the most clear conclusions from the test survey data, rising them as working hypotheses.

For almost all of the inquired students the gender of the lecturer doesn't play any role when choosing a lecturer course, only the professional qualities are favoured in both men and women-lecturers- high professionalism, intellectual capacity, communication skills, pedagogical abilities. It is interesting to notice that students declare that their perception of academic lecturers is not influenced by lecturers' erotic emanation. But the same students asked about the most significant characteristics of the ideal image of the man and the woman in general, nominate erotic womanly emanation and masculine qualities to be of crucial importance. On the second place they appreciate common for both men an women qualities as intellectual capacity, sense of humour, frankness.

So, the conclusion could be made that the prefered characteristics of university lecturers are not influenced by their gender and the qualities required from them encompass the good performance of their social role. It is interesting to notice that the ideal woman lecturer is thought as entirely different 'animal' from the normal woman. The woman-lecturer is seen in the light of her institutional mask not in the light of her sexual womanly characteristics. On the ideological level we have no data for presence of gender discrimination towards women-lecturers. The same is supported by analyzing the answers whether a woman can be a good scientist. The greatest part of the respondents gave the positive answer. All respondents accept as normal for a woman to be their boss. But the concrete estimation of students' own women-lectures reveals some unsatisfactions. Half of the respondents answer that in some aspects the women-lecturers seem to be inferior in comparison to men-lecturers. Their most frequent fails arise from their unrestrained emotionality, leading to some communication disturbances.

All these conclusions stipulate the hypothesis that on the ideological level the presumption of equality of men and women works and gender discrimination towards women-lecturers in not seen. That's why it is more likely that the dissatisfactions from their concrete work could be explained more by the lack of self-confidence, than by some kind of underestimation by their students. It seems interestng to compare the self-image of women-lecturers with their image in the eyes of students and in the eyes of their colleagures, too. May be the problem lies in the strife of men-lecturers to preserve their dominant position by underestimating their female colleagues. All these working hypotheses should be studied in the course of further investigations.

METACOGNITIVE ASPECTS IN A GROUP-BASED PROJECT WORK AT TECHNICAL UNIVERSITIES.

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Project work is assumed to be more friendly towards women's cognitive style than traditional disciplinary classroom teaching. Furthermore, project work is assumed to be a solution to decrease drop out rates and to minimize overload problems in all technical subjects. Many technical universities are on their way to or have implemented project work in single subjects or at specific terms.

Practizing project work, however, is not just easy, because project work requires another cognitive style than the one used in traditional disciplinary classrooms. Therefore, starting up and practising project work gives problems to both teachers and students. In this paper I will discuss the cognitive and affective aspects in problem and group-based project work and outline certain elements which teachers and students must necessarily be aware of before starting up.

INTRODUCTION

Project work has become more popular at technical universities both in the first year programmes and in the M.Sc. programmes (Johannesson 1991. Smith and Ryan: Probe), and furthermore, the use of project work is growing within single subjects in the entire engineering programme. Only few technical universities are fundamentally based on the project learning concept, e.g. Aalborg University, founded in 1974 (Creese 1987, Kolmos 1991, Østergård 1990) and Roskilde University, founded in 1972 (Beyer 1992).

As a concept, project work covers many types of cognitive processes. It may be a part of a single subject, an introductionary programme in the first year, or a fundamental organized curricula. It may also be problem-based projects starting by analyzing and formulating the problem, or it may be more like case studies which are often used to illustrate particular elements in specific disciplines. Furthermore, it may be individuals or groups of students working on projects. So it is very confusing whatever people mean by saying project work. In this paper, project work is defined as problem and group-based project work.

No matter which type of project work one is practising, it requires awareness of a very specific learning process among both teachers and students concerning cognitive and affective aspects.

By emphasizing metacognitive aspects (the cognitive and affective aspects), I stress the point that knowledge about how to learn and the particular elements in the learning process will progress the learning process. In project work conscious awareness about these metacognitive aspects is a necessary base, because both teachers and students are enrolled in an active investigating learning process. This process might be easier to explain by comparing elements of the learning process in doing assignments and projects.

Assignment:

Process:	Question	Methods	Result
Teacher:	+	+	+
Students	+	?	?

Projects:

Process:	Problems	Methods	Result
Teacher	?	+	?
Students	?	?	?

In the process of working on assignments, the teacher formulates the questions, knows the methods and has an answer. For the teacher, this process is rather simple, because it is a controlled process. For the students, this process is also rather simple, because the direction for their activity is given by the teacher's formulation of the question.

In the process of working on projects, however, it is getting complicated for both teachers and students. The teacher might not know the exact problem which is going to be analyzed and solved in the projects. However, the teacher knows different methods to be used in the field, but does not know the result or outcome beforehand. For the teacher this process will become a challenging interactive learning process with her or his students. As far as the students are concerned, it will be an even more challenging learning process: they do not know the direction for their project before they have analyzed and formulated the exact problem, and they have to learn methods and solve the problems.

At this level, the problem-based project work is already a complicated but challenging cognitive process, which is becoming even more challenging in a group-based learning process where oceans of affective aspects occur such as identity, feelings, attitudes, values, and experience.

This article is partly based on my experience from teaching a special 12-contact-hours-course called Methods in Project Work (PA), placed right in the beginning of the first year programme at the Faculty of Technology, Aalborg University, and partly on my experience as a super visor to the project groups. In the PA course we introduce both cognitive and affective aspects in the project work, and it may be characterized as a verbal study guide in project work (based on Algreen-Ussing and Fruensgård 1991)

SETTING THE SCENE

In the middle of June, Clara finished the Danish "gymnasium" (upper secondary education) with two A-levels in mathematics and physics. During the last year in gymnasium she was very doubtful in her choice of university study, but ended up by choosing engineering. However, she was very uncertain concerning choice of engineering branch. Clara lived in the southern part of Denmark and she had to move to enter one of the two technical universities in Denmark, Technical University of Copenhagen (DTH) or Aalborg University (AUC) (for an introduction to the Danish system, see Vinther 1992). She chose the AUC, because she was more attracted to the pedagogical concept with groups and project work than to traditional lectures, and because she could put off choosing her special line of study until March in her first study year. She was a bit worried about the group work, she tried some kind of it in gymnasium but without any great success. On the other hand, it would give her the possibility to get in touch with other students.

Clara started on September 1.th. at the AUC. She was placed in a main group consisting of about 100 students, a secretary and some teachers. The common base for this main group was a theme on Technology and Working Environment. On the first day she was placed in a group with 6 other students - one of which a woman, and the rest were men. During September she and the rest of the group were working on a smaller pilot project - more like a case study one teacher told - to try out the group work. In the project they should write about the working environment in a brewery based on literature collected beforehand by the teachers. They wrote a report on that topic and were all evaluated together in the group. The teachers had no restrictions in this particular evaluation, because the entire process was to try the group work and project work.

Clara was a bit frustrated - it was very hard to recognize her own contributions to the project. Kenn - one of the other students in her group - had tried working a lot in groups, and she felt he had controlled their working process too much. The others admired Kenn, he was just so brilliant, had humour, good at jokes and so, and each time he said something, the others just accepted. Often she was saying the same thing, but the others did not respond in the same positive way.

In the beginning of October they should start a new period and it was possible to set up groups on their own. The whole main group was on a 3-days-stay in a cottage, and she had the possibility to talk to other students at a more social level. She decided to withdraw from the Kenn-group and enter another group. They were 8 in this new group, a mixture of people from 3 former groups. She really believed in this group, they could make fun together, discuss, disagree and apparently there was no "real leader".

Right now, at the end of October, they are about to analyze and define the problem - and they discuss a lot - nearly too much. They already feel that they are running out of time, because they must finish this project about Christmas, and they are examinated in January, after which the marks passed or not passed will be given. The problem was also all the lectures. In principle, she should use half her study time on the project work and the other half on lectures in mathematics, physics, computer science, technology and science, communication and a lot more. In practice, they had much more lectures in the beginning of the period, and at the end of this period there would be more time for the project work. But even though, their super visor told them that they had to calm down and that frustration was a necessary part of cognition, they felt frustrated that they did not know yet what technical methods they were going to use.

They decided that they would work with human machine interaction to improve the working environment in a control room. They were reading, finding literature, and planning a visit on a power station in one of the control rooms. Before that visit, they could not say what their project would deal with - if it should be construction of a new whistle system, or a simple computer interface or... It would depend on the problems they would see and what the operators would say. It was a bit of a confusing process - but on the other hand it was really exiting - especially after they came in contact with the power station, it became more concrete.

It was difficult to get used to a new teacher role. Attending lectures was no problem at all, but these meetings with their super visor were difficult to use. The teachers would not give an exact answer - but in the beginning they asked a lot of questions - did you find anything at the library - why do you think so - is this a problem? ??? Elder students had told them that it was a question of getting used to a new teacher role and after some time, one knows better how to use them, and that already in the spring semester, they would know how to make projects and use the teachers.

DEFINING THE METACOGNITIVE PROBLEMS

Clara's story implicates a lot of different problems, which are only some of the problems occurring in a problem and group-based project work. No matter which problems I would have chosen to describe, it would indicate the marriage between the cognitive and affective aspects of learning.

For example the conflict between Clara and Kenn where Clara felt that she was not taken seriously in the group discussions. What is the problem? Is it because

- Clara did not have enough knowledge?
- Clara was not good at structuring her knowledge in a logical argumentation?
- Clara had a lack of self confidence in her knowledge and therefore was weak as an intermediary?
- Clara was not respected by the other group members due to some other situations?
- Clara was secretly ridiculed by Kenn?
- or something else?

Of course, the relation between knowledge and communication will always be tightly intertwisted, but the point is that in a group-based project work the communicative aspects will exist in the entire process whether it might be the verbal or written communication in the group work. Therefore, it might be very difficult to both teachers and students to recognize and define their own learning problems.

By saying this, I am not trying to avoid project work - but on the contrary, I am trying to stress the fact that if any group-based project process has to become a success, it is necessary to put some landmarks on the map. These landmarks are important each time new students and teachers are going through such learning processes. In the PA course, we are trying to set up landmarks. In the first period, it is both the cognitive and affective aspects. In the second semester, we teach another 12-contact-hours-course basically on cognitive aspects.

COGNITIVE PROBLEMS

Particularly in the problem-based project work, three cognitive landmarks are important already in the first year of the university study: problems, scientific knowledge and scientific methods. In the first part of the PA-course, placed in the first period, we give an overview of the cognitive steps in a project process: problem analysis, demarcation of the problem and the project, problem solving, and conclusion/assessment. In general, these steps describe the process in a project. Furthermore, we define problem-based learning and give tools to work in a problem-based way. We discuss the concept of methods and at last we introduce how to find, choose and criticize source material. In the second part of the course, we give a much more fundamental introduction to create scientific knowledge and use scientific methods in the process of problem analysis and problem solving.

In this first year of the study, there is a rather high level of cognitive objectives according to Bloom's taxonomy of educational objectives (Bloom 1956, Laursen og Olsen 1991, Laursen og Olsen 1992). Bloom (1956) operates with 6 cognitve objectives: Knowledge, understanding, application, analysis, synthesis and evaluation. Of course, during the first year of study and the entire M.Sc programme, these cognitive objectives form a progression. However, this progression is characterized by a deeper understanding of all cognitive objectives, and this development can be illustrated as a spiral.

No matter at which educational level, a problem-based project work will require all

6 cognitive objectives. Let us return to Clara's story to exemplify this statement. Clara's group starts the project on working environment in control rooms by finding literature, reading, discussing and writing about the situation and the problems of the control operators. They read some more theoretical articles on man maschine interface. They went out visiting a control room in a power station and decide to make a one-day observation of the control room and to interview the operator. They write about their observations and their interview. At this stage they have material for writing the problem analysis part in the project and to define their problem. The result of this writing process may end up at different cognitive levels ranging from a level of understanding to a level of synthesis - it will depend on the outcome. If it is a description, it is on a level of knowledge; if they manage to use some theoretical concepts, e.g. in describing their interviews, it may be on a level between understanding and application; if they manage to use the theoretical concepts, integrate other investigations and compare them with their own findings, defining the problems and choose one problem for solution, it may be a level between analysis and synthesis.

The next stage in Clara's project is to find out how to solve the problems and choose one of the solutions. It is the same procedure, finding literature, being creative, reading, discussing and writing. At this stage and on the basis of the problem analysis, it is important that they make demand on the solution for making the "right" choice. Again the level of cognition will depend on the outcome. At the third stage, the problem solving stage, it is the same methodical procedure. Each project stage may end up in different cognitive levels, but in practice the reached levels during the projects are rather similar.

Another dimension of the cognitive objectives in project work is how the integration of all the stages (or chapters) are argued during the whole project, e.g. is there a logical line between problem analysis and demarcation of the project - or did it fall to peaces?

Stating that project work will include all cognitive objectives is not the same as saying that they do. Hopefully the above example has shown, the projects end up in fulfilling different objectives. In an analysis of project reports at psychology, bachelor level, Olsen (1992) has shown that more than 50% of the projects end up with describing level, which means a cognitive level between knowledge and understanding. However, my point is that students working on problem-based projects will meet cognitive demands on all levels, and therefore it is important to introduce a cognitive framework to them.

AFFECTIVE PROBLEMS

Affective problems are getting visible even to the students themselves, because they are in a social context working on a group-based project. When the students start their first year programme, we have formally set up the groups in a first pilot period where the students have to try a problem and group-based project work, as described in Clara's story. The main purpose for this period is not the cognitive aspects but much more to let the students experience affective aspects, e.g. how to organize and how to collaborate. In the PA-course we introduce two main landmarks: the organization of the students' working process and the psychological aspects in collaboration.

At the organizational level we give advice on how to write, organize and edit their working papers. In a group of 8 students it is rather difficult to find a balance between the individual working process and collaboration with others, so we give very practical advice on what individuals must know about the project before going home writing, how to discuss individual contribution and put them into a collective project process, how to give and receive criticism, how to edit all the contribution in the end in order to submit a common report on basis of the project work.

At the psychological level we give advice on how to give and receive criticism without any personal attack. How to develop individual and common group identities is one of the really hard nuts where we can illustrate problems and situations and nothing more. However, it is one of the aspects we emphasize, because it is one of the biggest problems at the psychological level. When do you have to manifest yourself and when is it time for letting others do it? What about leadership and power? This is not at all easy questions to answer, but the point is that the students become aware of the fact that the group-based project work challenge the development of one's personal identity and that they have to work on that level as well.

A project-organized curricula needs active and curious students enjoing to learn, otherwise the supervisors will become the ones giving the ideas and controlling the learning process. So to the students the learning process is also a question of learning and daring asking the questions and overcoming one's feeling of being stupid. Supervising active students is rather easy, however, it is a pedagogical challenge to supervise "blunt" students, and that statement leads me to some final remarks on the teacher responsibility.

TEACHER RESPONSIBILITY

Teaching a course and being on the stage for 12-contact-hours in the first period and another 12 contact hours in the spring semester will mean nothing, if the course is not supported and in agreement with the other teachers. Before starting the semester, we teach the same lectures to our colleagues, and the final content in our course is made in cooperation with the other teachers.

The teaching role as supervisor to the groups is special and very unlike the normal lecture role both concerning cognitive and affective aspects. Supervisors must be very open minded at the cognitive level, and at the affective level they must dare to interfere in very complicated social processes. Both aspects are rather difficult to handle and each teacher has her or his own personal strategy. At the institutional level we have no compulsory pedagogical training, but it is possible to join pedagogical courses. It is a lack to all universities, but indeed it is a lack to a project-organized curricula due to a quite different teaching role.

Two educational research projects (Rasmussen 1991, Kolmos 1989) e.g. investigate students' expectations to and experiences of the supervisor role and the lecture role. Rasmussen (1991) finds that one of the most important abilities in students' expectations to and experiences of the supervisor role is willingness to advise and supervise. Concerning lecturing, the most important expected ability is the ability to give precise and concrete explanations, whereas the experienced ability is mastering the subject. These results are supported by Kolmos (1989) according to whom the students expect the supervisor to be involved and to point out new problems and dimensions in the project, whereas the students expect lectures to be involved and to give precise and concrete explanations.

These research projects indicate the more flexible and open minded supervisor role and stress my point that starting up or practising project work requires this awareness of different teacher roles - even at the university level.

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Being a student at Delft University

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A break with the past

Studying at a university implies a lot more than attending lectures, doing tests and passing examinations. Entering a university is also entering and discovering another world. The moment youngsters start studying at a university, it is, for those who are to become students, simultaneously the moment they have to say farewell to (among other things) the life they lived before, the people they used to live with and the cities or villages and houses they inhabited. From the moment they are enrolled as students these people are supposed to 'be' students, although most of them do not know what this all means. It takes some time to get acquainted with this sudden change.

Being a student at a technical university implies for most students also a rigorous break with the past. The world they enter is a world which is almost exclusively peopled by men. With the exception of clerical workers, women are almost invisible in the university buildings, at least within the so-called technical faculties.
However, formally, men and women are equally welcome.

(Dis)appearing equality

It is often stated that the fact that women are a minority (as students and lecturers) counts for the little interest of female youngsters to become a technical student and to practise a technical profession. Yet there are always women who sign up at the Delft university through the years, who wish to become succesfull students. Their qualities in terms of aspirations, knowledge of mathematics and natural sciences are equally sufficient.

The characteristics of a potentally successfull technical student are, according to one of the Delft brochures, as follows: A succesfull student behaves disciplined, spends a lot of time studying -even when this implies refraining from other, more attractive activities-, is strongly motivated to study, has sufficient knowledge of foreign languages and is very interested in technical matters. Above all it is considered important that the student is gifted with talents concerning natural sciences and mathematics. Such talents are considered evident when students received the mark seven or more for mathematics and natural sciences on their yearly rapport cards. (1)
Of course there is reason to doubt whether it is appropriate to predict a succesfull career as a student and (afterwards) as engineers on the base of these qualifications. In her article Sally Hacker pointed to the fact that : (....) mathematics in general, calculus in particular, represents only one aspect of engineering: engineering as algorithmic, mathematical, scientific technique. (...) it is not the whole of engineering, nor does technical expertise encompass everything the engineer must possess. Such important qualities as judgement, experience, understanding of social complexity, to name a few, must not be neglected." (2)
Yet some qualities have been neglected or at least considered of less importance in this brochure.

It should be noticed that differences between potentially succesfull male and female students emerge in recently published brochures. At several moments women are explicitly adressed as people who (wrongly) hesitate to enroll as technical students. This apparently strange phenomenon can be explained (according to the author) by the fact that technical universities are supposed to be a man's world. He suggests that a closer look at reality will reveal that this is untrue.

On the condition that they are interested in technical and scientific matters and in acquiring what is called alpha and gamma-knowledge, women appear as potentially succesfull students. While adressing women, the author stresses that studying at the Delft technical university implies the development of social capabilities. The necessity of receiving the mark seven or more for mathematics and natural sciences remains unmentioned in these paragraphs. As a consequence this seems to be of minor importance for female students and engineers.

The brochure gives the impression that social aspects of studying at a technical university are stressed to attract especially women, while generally the study is described as technical and mathematical. The very same words with which the Delft Technical University tries to represent itself as a place where men and women are equally welcome, reveal that men and women are regarded as two separate groups, with different behaviour, characteristics, aspirations and qualities. On beforehand women students and engineers are supposed to differ from male students and engineers.

Although it might be tempting to define the traits of the potentially succesfull technical student as male characteristics, it cannot be excluded that female students share them.

Research for example has shown that they are (extremely) good at mathematics and natural sciences. At the Delft university it is no exception when a woman has actually proved to be even better at this then their male peers at high school.

Probably these women are equally interested in technical subjects and not afraid at all of formulas or technical devices. Yet they are considered and treated as different.

Research on the absence of women at technical universities leaves several questions unclarified. There is (for example) the problem that, even when their qualifications are better than those of their male peers, they rather enroll for other (so-called: social) studies.

Male culture

It is suggested that one of the factors which explain the invisibility of women at technical universities is the male culture at these institutes. On these locations traditional opninions about men and women as separate groups dominate. During lectures these opinions are supposed to become manifest.

Thorough research is not necessary to find illustrations in readers in which traditional images of men and women occur. For example, in a reader concerning psychological theories and terms, the following example is presented to explain the term 'psychological field':

"Mister P arrives at home in the afternoon. He has worked all day, it is still early and he wants to go fishing. (...) Fishing is the aim (a) (...) P could also decide to assist his wife washing the dishes (b) or to read the newspaper (c). His wife (d) prefers him to do b or, second best: c. P realizes that she is a part of his psychological field. In this field there is also P's friend (f) who wants P to go fishing with him, and the weather (e) that is registrated by P. (...) Inspite of his wifes grumbling -he's often gone and she needs a hand from time to time- P decides to go fishing with his friend. His friend and the nice weather are the most powerfull forces in his psychological field, which drive him towards fishing." (3) In these sentences traditional opinions about a couple's daily life are carried into a scientific analysis. Nothing is said about the traditional (and unequal) allocation of tasks between these partners, not a word is spent on the fact that this man ignores his wife's wishes although they may sound reasonable. As a matter of fact the idea that a man has the right to relax after working all day seems very acceptable, especially because the story does not include the woman's daily work.

This is just one example, but of course a closer look at the readers reveals a lot of these traditional images.

By asking female students about living and studying at the Delft university, we tried to get some clearer pictures of our university's culture and of it's impacts on female students.

Ambiguities

When female students are asked straightforwardly whether gender is considered of any importance, at first they answer unanimously negative. They illustrate this with stories about their success, future aspirations and capabilities and their assertive behaviour towards boys and men. In their stories, girls accentuate the fact that they are not different; they are just like the boys. Although they notice that there are only a few women compared to the number of men, this is not accepted as a fact that counts for any significant difference at all.

In stories concerning daily practices at the university, an interesting phenomenon appears: despite the fact that these women believe, feel and act as if they are students in the way their male collegues are, they sometimes experience that they are treated as if they are a special, different or even an alien species.

Reversibly, when we take a closer look at the way male students reflect upon the presence of female collegues, or the impact of this presence, these feelings are remarkably accurate.

Creating differences

As part of a project on the male character of the University of Delft (1989), Studium Generale held a series of interviews with male students and employees.

What is striking, in the interviews with the students, is the emphasis on group-behavior, loneliness, the fear for real friendship, fear to fail, and the urge to keep one's ground - socially, and within the study.

On the one hand, the students describe their behaviour in terms of social awkwardness; in this respect, however, it is very interesting that the Technical University is also called a relative safe place to be -sharing the problem with so many seems to eliminate it. 'You can very easily hide between those men (i.e. the 'socially clumsy' ones) and find a way to go on. I think that's precisely the reason why the Technical University is so attracive to men. And that continues after university, in your profession. (...) An important part of your life you can stay within that world' (p. 30).

In this respect, the students' 'corpora' play a very supportive role; '...someone who is raised and stays in that culture, has far less to sort out in life. That gives a great amount of security; many things, norms, rules, laws, ways of thinking are fixed already. (...) It offers safety, just like many people draw strength from faith' (p. 38).

Stereotypes

Of course there is no such thing as 'the typical Delft student'. There are at least two of them: the boy for whom a university is just an extension of high school-life: quiet, shy, bad at sports, excelling in mathematics, physics and playing chess -preferably with his computer; the one who doesn't seem to be aware of his physical appearance -colours don't match, his trousers are too short. The stereotype sounds old-fashioned, but in Delft there are a lot of them, just as, for that matter, there are a lot matching the other stereotype: the well-build, better dressed, rather clamorous manly boys. In public, they emphasize their appearance by speaking loudly and laughing exuberant; in general, they are taking a lot of space. Their lack of social skills is refrased in terms of uncomplicated, straightforward behaviour. The presence of some women protects this behaviour of becoming too rude. As one of the students puts it, speaking of the Corps: 'It's a good thing that the proportion (between men and women) isn't a fifty-fifty one - in the corps it is 12%- but that it is a man's world, however influenced by women. In the early days, when it was a man's world thoroughly, a member of the corps may have been a terrible blunt, straightforward, ruthless fellow, but due to the presence of the ladies, I think all that straightforwardness becomes relative. And that has a very positive influence upon our behaviour.'

No wonder that, as far as this type of idealisation of the own conduct is concerned, the entrance of women on more than the current -i.e. modest- scale, is seen as a real threat: it would spoil the party, of course. But moreover, it would reveal the real problems lying underneath: the lack of social skills and abilities, the individual fears and loneliness hidden behind this type of conduct.

On the other hand some of the students do have a less protective attitude towards this male world. The entrance of more women -students as well as teachers- could create a more intimate, friendly, and homy atmosphere, which might even attach technology itself. In both cases, however, the presence (or absence) of women seems to make all the difference. What is interesting is not the question whether these expectations (positive or negative), and the supposed impacts, turn out to be true, but how they affect the experiences and attitudes of the female students.

Tough world, safe place

In this climate, where there seems to be a real psychological interest in keeping technology a man's business, or just the opposite, women are supposed to act and work normally and naturally, to take it all for granted. Of course, to a certain extent it is normal to adjust, finding a way to cope with a new life as a student, and that counts for men as well as for women. But on the other hand, it remains to be seen whether for women the technical university offers the same psychological shelter in terms of safety and security mentioned above. As a female student puts it: 'Delft is a very tough world; I once was an enthusiastic and vivacious girl, but I have developped a kind of 'don't touch me behaviour', surly, on the outside'. She stopped talking about the position of women in society, and in Delft, when she got these standard-reactions like: "look at nature; there, women do take care of the youngsters as well". In her first week at the university she noticed three boys at the same time had fallen in love with her, an unknown and rather strange experience, especially when this turned out to be an annually phenomenon.

Of course, we are not supposed to generalize on base of these interviews, or to jump unto conclusions. But, whereas several studies have been done on the influence of a-symetrical proportions between the sexes upon their behaviour, and some studies on the experiences of female students these interviews do give some indication that psychological factors as well must be taken into account.

Notes

1 In the Netherlands the marks are ranged from 0 to 10. A 10 means: excellent.

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I REFLECTIONS ON GASAT WORK IN THE FIELD OF EDUCATION AND SCHOOLING

4 Attitudes, behaviours and preferences of subjects at school

FOSTERING GENDER EQUITY IN SCIENCE AND TECHNOLOGY EDUCATION

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Brief surway is reported of studies fucosed on attempting to explain the sex-related differences in science end technology achievement, and their results.

The results have indicated few significant gender-related differences in performance among 13 years olds, and the emergence of gender-differentiated learning interests and attending to among 15 aged students.

In order really to give girls and boys the same opportunities to take an interest in science, it is necessary all the children experience and enjoy scintific activities since primary school.

Thus the social contest of education is involved:
- primary school teachers training teachers course
- curricula selected in order to emphasize bot the girls' and boys' points of view.

Many studies have focused on attempting to explain the sex-related differences that have been found in science achievement. These studies have generally taken two theoretical perspectives namely biological and sociological. Sociological explanations have received more acceptance in the educational community (Kelly's statment (1981)).

Strong support for the sociological perspective comes from studies that have examined the science experiences of male and female (Johnson et al. 1983). The leisure activities and science interests of boys and girls have been identified as already divergent by the age of eleven.

The discrepancy in physical science is visible at such an early age when pupils have received relatively little direct science teaching.

It suggests differential experiences of students in their everyday out-of-school activities must be influential.

Kahle and Laks (1983) by age nine female although having the same or greater desire of partecipate in science activities, had fewer experiences than males of the same age.

Lie and Bryhni (1983) in a Norwegian study of 500 pupils in grade 5, found a striking correspondence between experience and test scores in science. They noted that the general trend was that the two sexes had very different experiences. They also noted that the interest of female and male students were reflected in areas of science where they had obtained out-of-school experiences at an early age.

Farkas (1986) found that for items that produced higher scores by males, the males tended to rely on out-of-school experience to answer the questions to a much greater extent than females, who tended to use in-school experiences to determine the answer.

Parker L. and Offer - Gave a strong argument for the role of in-school experiences (their review of sex differences under the Achievement Certification system in Western Australia). They conclude that when the number and nature of science courses previously taken are controlled for, sex differences eventually vanish.

Teitelbaum (1986) argues that what we have been taught to accept as standard scholarship is "androcentric" knowledge that emphasizes masculine interests or point of view.

Specificlly she notes that "knowledge" and "science" are not universal and that they are androcentric form of knowing and of doing science, so we need to use a new standard, based on gynecocentric knowledge that emphasizes female points of view

Finally Roger Lock (1992): There were few significant differences between performances of boys and girls in practical science skills assessed by this study. No gender differences were detected in observation, reporting, or planning skills, and there was no differential performances on the use of scientific language. However, girls performed significantly less well in relation to self-reliance category, and performance difference on the interpretation skill approached significance, again with boys' performance superior.

All the results agree there are few significant gender-related differences in performance before the eighth grade (age 13-14). In the next (14-15 age) the emergence of gender differentiated learning interests has been found out, and different ways boys and girls attend to. At last the patterns of reasoning, which are more characteristic but nevertheless confined to girls, are usually negletted in science class.

It needs, I think, to deal with the situation in the short run and in long one:

- more research is needed to find out the exact patterns of reasoning in which both the boys and girls can excel, and the specific ways in which science instrution can accomodate to these differences.
- in order really to give girls and boys the same opportunuty to take an interest in science it is necessary all the children experience and enjoy scientific activities at primary school before they are given sex-differentiated duties.

Thus the social contest of education is involved:

i) it is necessary to plan curricula selected in order to emphasize both the girls' and boys' points of view.

ii) it is necessary to set up right primary school teachers training courses.

Planning suitable curricula

In order to introduce since primary school the girls and boys to science and technology it is relly important they are involved in activities concerning with topic they are interested to know, using:

- material and tools that are well known by the children in their enviroment.
- technique familiar and psychologically acceptable to the children

Finally it is very important the topics (to be investigated) are selected in order to emphasize both the girls' and boys' knowledge and points of view.
E.g.:
- the subject dealin with the classroom activities can chosen by the girls and boys in turn
- different approaches to open a subject can be proposed to girls and boys, caring for the results to get together.

The children are thus led to think that all kinds of skills and knowledges are useful for understanding and doing.
They also get accustomed to working together and sharing activities and responsabilities. It may be that it is going to contribute to break down the inequality barriers in the workplace in future.

Training teachers courses

I know of not few teachers (men and women) who think that science is something very strange and complicated, invented by people with a very large brain and that cannot be understood by ordinary people; fortunately - they argue - science does not affect everyday life but only the esperiments carried out in the laboratories!
At first it is necessary to covince the people, particularly the teachers, that the science is simply a reasonable, understandable and useful description of the world; at the second but nontheless the teachers must get convinced the primary school children enjoy and appreciate scientific ideas and activities.
Which kind of training courses?

The results of myself experience are reported. I 've attended with my colleagues (university Science teacheres and reserarchers) in preparing several different training courses:

a) Lectures and laboratory activities, dealing with science topics (physics, chemistry and biology) have been proposed to the teachers (adult education)
b) the teachers have been introduced with some teaching projects (science topics): methods and contents have been explained and operating procedures of experimental work have been also shown
c) the teachers have been involved, with their pupils, in some teaching modules (primary education). They partecipated with their pupils in doing experiments, interpreting the results, discussing the meaning and so on.

Outcome

a) the teachers did not change their mind towards the science although they seemed feeling themself to blame for.
b) the teachers thought they should get educational recipes; really they could not use the recipe in classroom because of their lack of adequate background.
c) the best results have been obtainned: the teacher were not anxious because they did not responsable for training the children. They felt free to pose questions, to say "I 've not understood".

Thus they really understood the meaning of the activities aimed to familiarized the pupils with primary science, and the reasoning way the children used to use. They also realized that in order to train the pupils an adequate scintific background is necessary.

Conclusions

Some examples are reported of successful activities in which the primary school teachers and their pupils have been involved.

The children and their teachers have been introduced to a first idea of structure of matter; namely they have been led to grasp the properties and behaviors of the objects depend on the inner structure of material they are made.

A set of objects made of different materials (polystyrene, cork, playwood and firewood) having the same size have been tested in various experiments: Waterproofness - Thermal conductivity - Acustic conductivity - Burning test. The activities proposed have been aimed at interesting the pupils in observing the facts, to explain the results and to carry out new testing experiments.

The children (and the teachers) partecipating in this project have really understood the meaning of the experiments, they also have given the picture of the materials structure in terms of the concepts draw on from their everyday experience.

Finally as concernes the teachers, we noted they have found the project particularly attractive because of the ready availability of everyday substances and the wide range of possible activities, which can be performed with little specialized equipment and without theoretic topics. They also have been motivated to get adequate background.

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An Investigation into Gender Bias in Educational Software used in English Primary Schools

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There is continuing evidence of gender bias in the use of computers in schools. Boys greater access and confidence is multi-determined, however important one factor is the nature of the packages themselves and the imagery they deploy. Unlike in the computer games sector where images remain crudely sexist, educational software providers have developed software which attempt to use 'androgynous' humanoid figures where gender stereotypical features are absent. There is however no social or cultural warrant for human representations which are non-gendered. We hypothesised that children would have no notion of genderless persons and would assign gender to the figures reverting to male as norm, but that girls would be more likely than boys to identify androgynous computer characters as female. In our study we asked primary school children to talk about the images, making up names and describing them. Content analysis of the data was used and a gender constancy test was included as a check for validity. A small pilot study supported our hypotheses and preliminary results from a larger scale study confirm that children identify non-gendered images as male, but that girls are more willing to see them as female. We conclude that more research should be undertaken into the ways teachers can influence the child's perceptions of gender. More thought must go into the design of gender balanced software through deconstructing gender stereotypes and offering more positive and disruptive images of females as well as a-typical representations of males.

There is widespread evidence that gender conditioning begins very young (Strangor and Ruble 1987) and is reinforced through the toys purchased and the nature of play (Fisher-Thompson 1990). Children demonstrate a preference for stories with gender stereotyped characters and story lines at a pre-school age (Kropp and Halverson 1983). Stereotyping within children's literature is often subtle and reinforced over time. (Tetenbaum & Pearson 1989). Experimenting with neutral characters in children's books has shown that adults reading books to children tend to stereotype the images and ascribe male gender to neutral characters, this is then copied by the children (Deloache, Cassidy & Carpenter 1987). It seems likely therefore that children entering school will approach stories and images in the computing medium with an already existing repertoire of gender assignment strategies.

There are multiple influences affecting the under-representation of girls in computing. Factors include unequal ownership and use within the home (Sanders 1984 Gilliland 1984), unequal access and use in the class room (Lockheed and Frakt 1984), teachers spending more time with boys than girls (Spender 1989). In the later years the associating of computers with science, mathematics and technology serves to reinforce further the differential interest boys show in computing (Hawkins 1985). However we could find no research that had looked at the reactions of young children to purportedly neutral images at the user interface. Manufacturers have attempted to ensure that some of the software available to schools does not suffer from obvious bias. It is more theoretically challenging to examine this non-sexist software than to look at obviously biased imagery since the readings available to children in overtly sexist packages are already relatively closed.

The meanings imputed to images in any computer package are likely to be affected by the environment in which they are used. However there is greater variability in the case of content free software such as word processors where overtly sexist messages can subvert the neutral form. Similarly, there is a problem where packages are being used to deliver a content which already displays gender bias, for example traditional fairy stories. Skill and drill packages exhibit none of these characteristics, their mode of operation is fixed but they are designed to be free of a specific identifiable content These packages therefore provide an opportunity to test out the hypothesis that even with attempted neutral images children will assign gender.

Despite the widespread use of 'androgynous' images in primary software, creatures displaying humanoid features but with no clear gender indicators, there is no literature which deals directly with these attempts to break the mould and create neutral characters. This is not surprising, there are no culture referents for representations of humans outside the categories of male and female. Indeed the difficulties of subverting representations of women (and men) has now become the subject of a extensive literature in the area of feminist art practice (Parker and Pollock 1987). There is also considerable evidence for the male as norm model (Spender 1980). On theoretical grounds therefore we hypothesised that not only would children assign a gender to sexually ambiguous humanoid figures but that they would revert to male. We further hypothesised that although male as norm would be the majority reponse girls would be more likely to identify 'androgynous' characters as female. It is important to test this. Since, if both girls and boys see computing characters as predominantly male the implicit presumption, on the part of manufacturers and educationalists, that girls will find these packages more friendly than overtly sexist ones will be weakened.

Race and class were included in our analysis in order to establish whether our hypothesis was robust in the context of other powerful influences on school performance. A theoretical sample (Glaser and Strauss 1985) with respect to race and class allowed for inspection of the data for patterns which could form the basis for new hypotheses for future testing.

The Study

A small pilot survey using one school established the basic procedure. A semi-structured interview was implemented by the researcher sitting next to the child as s/he played two skill and drill games. The interviews were recorded and processed through content analysis. As a result of the pilot some refinements were made. One of the packages was replaced as being too time consuming, we therefore worked with two packages PODD and PLAYPARK, both are available on BBC machines, the most widely used computers in British primary schools. PODD is a round red character with arms and legs and broad simply drawn features with a tuft of hair, there are no other characters or external graphics. PODD completes a *number of one word actions such as jumping and hopping*. The child selects the action, if the action cannot be completed PODD appears with the words *"Oh no I can't"*. The other package features a small white figure with a flat topped head and a large stomach when standing sideways. The figure has two holes for eyes and no other discernable features. The figure moves along a path and reads various playground objects. There are two static circles which act as a scoreboard. One circle smiles to indicate the child's success in reaching the designated object, the other one frowns to indicate failure.

The interview had three components. The children were first asked to describe the package as they played. This produced an initial unprompted response where the child could use either gendered or non-gender terms. The interviewer then elicited a prompted response by asking the child whether they thought the character was a boy or a girl or either. Finally children were asked whether they would change their initial gender assignment, so if they had described the figure as a boy they were asked whether it could be a girl. This negotiated stage was designed to establish how firmly the children held their views and whether they could be influenced by an adult mentor. Some simple gender constancy questions were also administered as a check on the validity of asking the children whether they saw the figures in gender terms (Leonard and Archer 1989).

Sample

Schools were chosen on the basis of a theoretical sample for race and class. Class was operationalised through the proportion of children on free schools meals, race was operationalised by catchment area on the basis of teacher expertise of the racial mix of their catchment and the school's overall statistics for ethnic origin. No attempt was made to directly categorise individual children other than with respect to the independent variable gender. In the schools a random selection of 5-6yrs were interviewed individually, taking boys and girls alternately so that the children could see that both sexes were playing. The sample consisted of 100 children based on one white working class schools, three racially mixed schools and three middle class schools. Because of the nature of catchment areas and the socio-economic status of inner city members of ethnic minorities the three racially mixed schools were also working class based on our broad definition.

Results

The scores from the gender constancy questions were 100%. These indicate that the children tested achieved complete constancy, this validates our procedure with respect to asking children whether they can make gender indentifications of characters.

In the initial identification stage 85% of the children assigned a gender to PODD, only 15% described PODD in non-gender specific terms eg *"it","red"*. The PLAYPARK figure was described as gendered by 75% of the children with 25% using non-gendered terms. The tables show the gender assigned by the gender of the child at the initial stage, prompted and negotiated stages.

Table I Initial Indentification

	Male	Female	Non-gendered	
Boys	80	0	18	98
Girls	70	10	22	102
	150	10	40	200

Chisquared $p > .01$

Results from Table 1 confrim the hypothesis that children do overwhelmingly assign gender and that male as norm prevails. However the results also confirm that girls are more willing to see the characters as female (significant at the 1% level) The prompted responses also revealed the same pattern, but interestingly the gender difference becomes more marked with girls more willing to see the figure as female, boys however remain extremely reluctant to depart from male as norm.

Table II Prompted Indentification

	Male	Female	Non-gendered	
Boys	93	4	1	98
Girls	72	30	0	102
	165	34	1	200

Chisquared $p > .01$ (because of the low values in the non-gendered category the reliability of chisquared is jeopardised. However the association also holds at $p > .01$ using only Male and Female columns)

Table III Negotiated Differences

	Male->Female	Female->Male	No-negotiation	
Girls	38	21	43	102
Boys	54	4	40	98
	92	25	83	200

This table illustrates the enormous impact of negotiation; suggesting that adult influence in this age group can have a significant influence on gender stereotyping in combination with non-stereotypical images.

Further analysis is being undertaken with respect to the other variables of race and class with the aim of formulating new hypotheses. Preliminary analysis however confirms that our overall results are robust with respect to both race and class.

Discussion

The research provides confirmatory evidence for our initial hypotheses. This has serious implications for girls, since it is evident from other research that girls rapidly learn that computers are not for them. However, more optimistically, our results do suggest that adult influence can work to lead children to change their initial male as norm response. This needs pursuing. The next stage of our research will explore the impact of teacher inputs as these may lead to either more female identified images or, if the mentor uses male as norm, may act to erode the minority of female identifications.

In terms of software developments our results lead us to question the viability of rendering packages non-sexist through the development of 'androgynous' figures. This strategy appears doomed to failure in a broader social and cultural context where the binary opposition male/female is so dominant. There is no cultural space which can sustain gender neutral humanoids and the responses of the children confirm this, with only tiny numbers sustaining non-gendered descriptions. Instead we would suggest that software designers could draw on the already existing theoretically sophisticated literature from art practitioners who have confronted the issues of deconstructing gendered images. Positive images of active girls in computer graphics will also fail unless they address the more difficult issue of male reversals. Designers of software cannot simply invent a new language but a knowledge of the ways children 'see' gender and how humour for example might be used to subvert it might produce images which could allow girls to find a place on screen as well as at the key board. This is an area where technology and the arts should come together if more girl friendly technologies are to be produced.

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CHOICE OF SUBJECTS AT PRE-UNIVERSITY LEVEL

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INTRODUCTION

In order to achieve that more women choose a technical study area at university level and as a result a profession in technology, proper arrangements have to be made for girls (as for boys) at an earlier age. These arrangements are: the choice of science subjects at pre-university level and getting interested in a career in technology. For emancipation as well as economic reasons the Dutch government tries to influence girls in particular in this preparatory phase. Mainly informative methods such as television spots, advertising and information bulletins, are used for this purpose.

In the Netherlands as in other countries many more boys than girls choose for a so called B-programme with physics and mathematics. Sex differences in choice for physics are enduring in particular. Research shows that girls judge their own ability in science subjects as lower than boys do, even when they have the same grades. Apart from that it is presumed that many parents think that girls don't need science subjects as much as boys. In the Netherlands Dekkers (1985) found differences between school counsellors too: some of them stimulate girls to choose science subjects, while others hold on to traditional ideas. Is providing information of any use if girls value these traditional ideas?

To answer this question a causal model of choice behaviour is needed. Eccles (1987) developped a longitudinal model in which subjective task value and expectation of success finally determine choice of subjects at high school. According to this model differences in socialization experiences cause sex differences in perceived utilities and costs of a subject and sex differences in expectation of success. Eccles stresses the importance of the different values girls and boys use in comparing their possible choices at high schools. What are these values and how do they influence study choice? In a research focused on pre-university students in the third grade (about 15 year old) we used Fishbein and Ajzen's theory of reasoned action to answer these questions.

The process of study choice and professional orientation is supposed to start even long before entering high school, but it is at the point of choosing arts or science subjects that values become salient. Research questions centered on this decision moment are:

> *Do boys and girls differ in their perceptions of their own abilities and in their attitudes towards science subjects? Is it possible to explain differences in the choices of subjects by differences in attitude and/or differences in perceived ability?*

These questions resulted in a questionnaire which was submitted to 461 third grade pre-university students from two different regions in the Netherlands.

In this paper a short introduction of the theory of reasoned action will be followed by a presentation and discussion of some of the results.

THE THEORY OF REASONED ACTION

The theory of Fishbein and Ajzen is a well known theory of attitude-behaviour relations. The model asserts that the stronger a person's intention to perform the behaviour in question, the more the person is expected to try, and hence the greater the likelihood that the behaviour actually will be performed (Fishbein and Ajzen, 1975; its summary is borrowed from Ajzen and Madden, 1986).

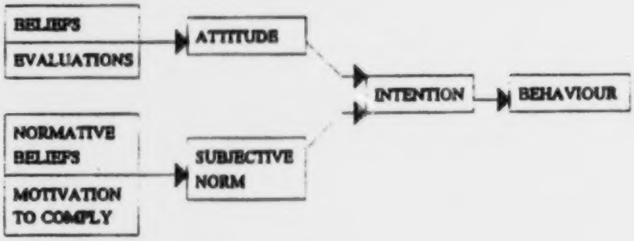
The theory specifies two conceptually independent determinants of intention. One is a personal factor termed attitude toward the behaviour and refers to the degree to which a person has a favourable or unfavourable evaluation of the behaviour in question. The second predictor of intention is subjective norm, a social factor. It refers to the perceived social pressure to perform or not to perform the behaviour. Attitude and subjective norm, each weighted for its relative importance, are assumed jointly to determine behavioural intention.

The theory also deals with the antecedents of attitudes and subjective norms. These antecedents determine in the final analysis intentions and behavioural actions. A diagram of the theory is shown in figure 1.

At the most basic level of explanation, the theory postulates that behaviour is a function of salient information, or beliefs relevant to the behaviour. Two kinds of beliefs are distinguished: behavioural beliefs which are assumed to influence attitudes toward the behaviour, and normative beliefs which constitute the underlying determinants of subjective norms.

Each behavioural belief links the behaviour to a certain outcome, or to some other attribute such as the consequence of subject choice for loss of leasure time. This subjective value contributes to the attitude toward the behaviour in direct proportion to the strength of the belief, i.e. the subjective probability that this choice will lead to the outcome under consideration. To obtain an estimate of attitude, belief strength is multiplied by outcome evaluation, and the resulting products are summed across all salient behavioral beliefs.

Figure 1: The Fishbein and Ajzen model



Normative beliefs, on the other hand, are concerned with the likelihood that important referent individuals or groups would approve or disapprove of performing the behaviour. The strenght of each normative belief is multiplied by the person's motivation to comply with the referent in question, and an estimate of subjective norm is obtained by summing the resulting products across all salient referents.

Research on sex differences in choice of subjects at pre-university level according to the Fishbein and Ajzen model will concentrate on differences in beliefs related to science and arts subjects and differences in evaluations of these beliefs, i.e. sex differences in valued outcomes of a subject choice and sex differences in subjective probabilities that a subject choice will lead to the outcome under consideration.

In this approach knowledge of salient beliefs is essential and it is here that Eccles' model is very helpful. She distinguishes four values that determine choice for a subject: intrinsic, extrinsic, costs and image (Eccles, 1987).

- Intrinsic values refer to pleasure and interest in the subject here and now.
- Extrinsic values refer to utilities on long term, e.g. the subject is required for a university study or professional education.
- Costs are defined by the effort study of this subject demands compared to other subjects. The estimation of costs is dependent on perceived own capacities.
- Image value of a subject is indicated by the degree a subject suits a person's personality or contributes positively to a person's self image.

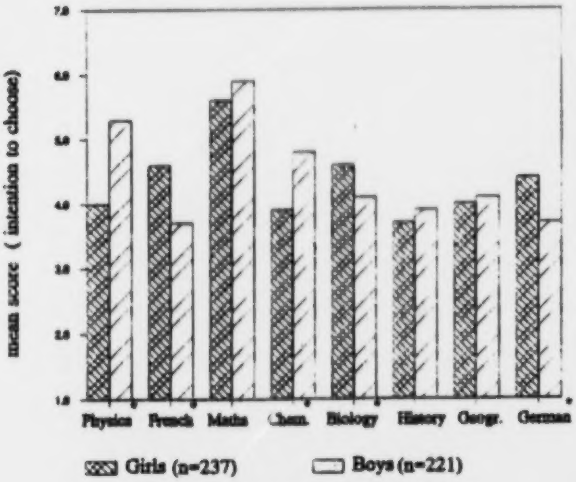
RESULTS

The questionnaire was submitted to third grade students (age 15) from six different schools in February and March 1992 and answered by 238 girls and 223 boys. In this period they have to indicate their intended choices for subjects in the following years at school. Final decisions are made in June, therefore the dependent variable is this paper is intention to choose a subject. The corresponding question in the questionnaire was: If you had to decide now, would you take .... (followed the name of a subject, such as Physics) in your programme next years? Answers were given on a seven point scale with 'definitely not' at one end and 'definitely yes' at the other. Figure 2 shows the mean scores on scales of all subjects for girls and boys separately.

Since Dutch and English are obligatory subjects at school, there are only data for French and German as far as languages are concerned. The other subjects of choice are Physics, Mathematics, Chemistry, Biology, Geography and History. Between girls and boys there is no difference in mean scores on the intention to choose Mathematics, History and Geography. Boys are significantly more intended to choose Physics and Chemistry; girls are more intended to choose French, Biology and German. It is the traditional pattern with a striking exception of Mathematics.

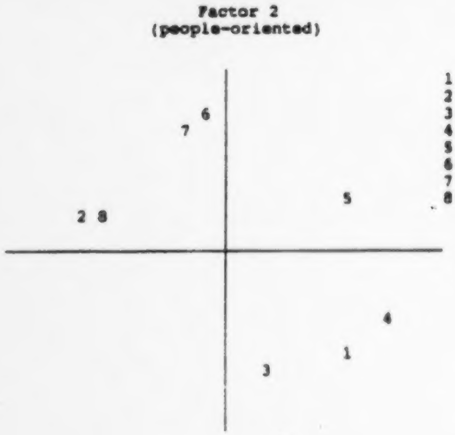
A preference structure at the basis of this choise for subjects was analysed by factoranalysis with varimax rotation on the measured intention to choose a subject. Two independent factors were found (Figure 3).

Figure 2: Mean scores on the intention to choose the respective subjects for the final exams on a 1 to 7 scale, for girls and boys separately



* Significant difference between girls and boys, p <.001 (t-test)

Figure 3: Factorloadings of eight different subjects (intentions to choose these subjects) on two independent factors.



Subjects	Coordinates	
1 = Physics	.666	-.503
2 = French	-.616	.182
3 = Mathematics	.200	-.646
4 = Chemistry	.798	-.308
5 = Biology	.677	.242
6 = History	-.029	.777
7 = Geography	-.142	.704
8 = German	-.567	.166

Physics, Chemistry, Biology and less strongly Mathematics have a positive loading on the first factor, all the others are negative. Therefore it is named 'matter-oriented'. The second factor shows opposite loadings, with the exception of Biology that is positively loaded on both factors. This factor could be named 'people oriented'. From further correlational analysis it is concluded that there is a preference structure indeed: preference for Physics and Chemistry are indicative for aversion from French, German, History and Geography and vice versa.

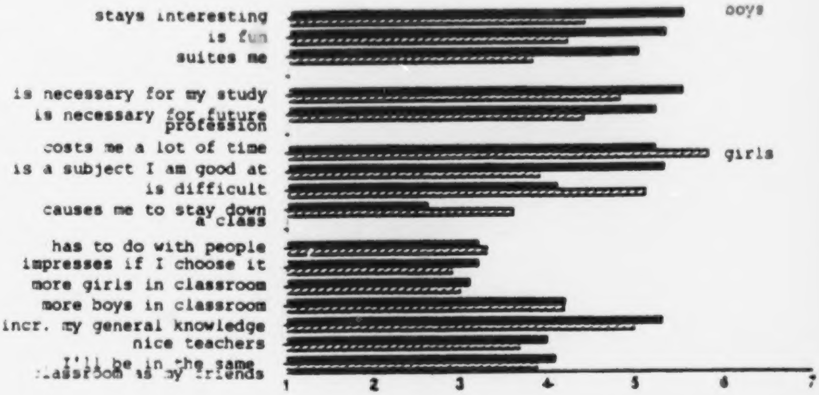
How many girls, compared to boys, are intended to choose Physics and Mathematics? Of all students 57% answered to choose physics either definitely or probably. However, this answer was given by 70 % of the boys and 45% of the girls. This difference is significant, but it is notable that almost half of the girls is intended to choose Physics. By comparison with data of other subjects it appears that there are few doubters of Physics: many students are either certain or not of their intention. Only 23% is a doubter of Physics as a subject, whereas doubters for subjects such as French or Geography constitute 50% or 65% of the respondents.

Attitude and subjective norm

The intention to choose a subject is according to the Fishbein and Ajzen model determined by the attitude towards that subject and the subjective norm. The attitude wàs measured by seven point scales on three questions: Choosing Physics is for myself positive/negative, attractive/unattractive and wise/unwise. The sumscore of the three scales has got a range from 3 to 21; mean sumscore of the girls was 12.6, and of the boys 16.0, a significant difference. The choice for Physics is less positive, attractive and wise in girls' eyes than in boys'. Is this difference also determined by a difference in beliefs or valued consequences of choice for Physics?

The influence of 16 consequences related to choice of subject were measured. Factor analysis on the data produced four factors, named 'intrinsic value', 'extrinsic value', 'costs', and a rest group of beliefs. Three values are correspondent to the four discriminated by Eccles. Her fourth value: image, was measured by one question only and this scale felt in the first factor because of its high corelation with answers on the two scales that described the intrinsic value. Figure 4 shows mean scores of boys and girls on 16 scales measuring beliefs of choice for Physics.

Figure 4: Mean scores on 16 behavioural belief questions for Physics; boys and girls seperately



Boys value the choice of Physics more than girls, because of the intrinsic values: they answer significantly more often that Physics stays interesting, is fun and 'suites me'. The mean score of boys on extrinsic values is higher too. On the other hand girls indicate more often than boys that choice of Physics costs time and is difficult. Girls also estimate their capacities in Physics lower than boys do.

Correlation of the intrinsic values, extrinsic values and costs with the overall attitude towards Physics is high: Pearson's R of each item with the sumscore of the overall attitude ≥.55. These beliefs can be considered as real components of the attitude towards Physics. The data support Eccles' hypothesis that differences in study choices are caused by differences in intrinsic values, extrinsic values and costs. Of the rest factor only the beliefs 'has to do with people' and 'increases my general knowledge' correlate significantly with the general attitude.

Not only behavioural consequences, but also normative beliefs determine intended choices of subjects according to Fishbein and Ajzen. Next step in our analysis is to compare data on the subjective norm. It is directly measured by the question 'Relevant others are of the opinion that I have to choose Physics' (definitely not/definitely yes, 7 point scale). Twenty one percent of the girls against eight percent of the boys perceive a negative opinion of others; 23% girls and 43% boys perceive a positive opinion.

Relevant others are supposed to be parents, peers, student counsellor and teacher. Figure 5 shows mean scores on the normative belief questions for eight different subjects. As far as the choice for Physics is concerned, the normative belief girls have in average of all specified relevant others, is negative; scores of the boys are positive on the average.

A causal model

According to the theoretical model 'attitude' and 'subjective norm' are weighted for its relative importance. Regression analysis of these two components on the intention to choose Physics results in explanation of 82% of variance with ß weights of .79 for attitude and .15 for subjective norm. The subjective norm appears to be less important as causal factor than the overall attitude towards Physics. The relationship between sex and intention is an indirect one, e.g. via attitude and subjective norm (Figure 6).

Figure 5: Mean scores on the normative-belief questions for eight different subjects, for girls and boys seperately.

Normative Beliefs	MEAN SCORE *) Girls (N=235)	 Boys (N=222)	
PHYSICS	**-0.5**	**0.4**	**
mother	-0.5	0.3	**
father	-0.2	0.7	**
friends	-0.7	0.0	**
classmates	-0.8	0.1	**
student counsellor	-0.4	0.6	**
physics teacher	-0.3	0.8	**
FRENCH	**0.1**	**-0.3**	**
mother	0.2	-0.4	**
father	0.1	-0.4	**
friends	-0.2	-0.6	*
classmates	-0.2	-0.7	**
student counsellor	0.3	-0.1	*
french teacher	0.7	0.3	*
MATHEMATICS	**0.6**	**1.0**	**
mother	0.8	1.1	
father	1.1	1.4	
friends	0.3	0.7	*
classmates	0.3	0.7	*
student counsellor	0.5	1.0	**
maths teacher	0.5	1.2	**
CHEMISTRY	**-0.2**	**0.4**	**
parents	-0.2	0.4	**
peers	-0.5	0.1	**
counsellor and teacher	0.0	0.7	**
BIOLOGY	**0.1**	**0.0**	
parents	0.2	0.0	
peers	-0.2	-0.2	
counsellor and teacher	0.4	0.3	
HISTORY	**-0.3**	**-0.1**	
parents	-0.4	-0.2	
peers	-0.5	-0.3	
counsellor and teacher	0.0	0.3	
GEOGRAPHY	**-0.1**	**0.2**	
parents	-0.1	0.1	
peers	-0.4	0.0	*
counsellor and teacher	0.3	0.4	
GERMAN	**0.3**	**-0.1**	*
parents	0.4	0.0	
peers	-0.1	-0.4	
counsellor and teacher	0.5	0.2	

** significant difference between girls and boys, p <.001 (t-test)
* significant difference between girls and boys, p <.01
*) the average of all relevant others for each subject is printed bold

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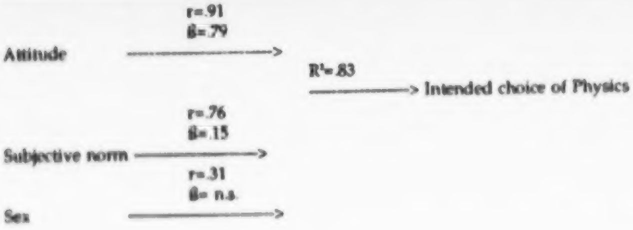
Figure 6: Regression of attitude, subjective norm and sex on intended choice of Physics



CONCLUSION

Differences in the choice for subjects can indeed be explained by different values and perception of the consequences of these choices. Girls are more modest in estimating their own capacities in science subjects and they perceive less support of relevant others as far as a choice for science subjects (Physics in particular) is concerned. However, weight of attitude is more important than weight of subjective norm. That is to say: if it is important to change choice of subjects, the most important components to change are intrinsic and extrinsic values and perceived costs, including estimation of own capacities. A hard task for intervention indeed.

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THE GENDER GAP IN LEARNING PHYSICS CONCEPTS

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It is generally accepted that the achievement level of girls in physics, especially in understanding and application of scientific concepts is lower than that of boys. The paper explores the use of Vygotsky's ideas of how scientific concepts are learned at school in the context of physics by girls. The need of relevant everyday experience as a material base for concept formation as well as the amount of mental work required by children is emphasized by Vygotsky. This gives an opportunity to deal with the question of assumed background knowledge in physics teaching and its variation by gender. The second aspect deals with motivation. Learning physical concepts requires effort, energy and time. Existing literature on social and didactic factors which have an effect on girls' motivation is explored. Special attention is given to the importance of girls' confidence on her own learning capacity as an element of motivation and to various cognitive styles. The concepts of affective and cognitive dissonance and their relation to gender in physics learning is discussed.

Experience, everyday and scientific concepts

The performance level of girls in physics is not generally lower than that of boys except in certain fields. Boys perform better than girls in understanding and application of scientific concepts, in technical and in spatial tasks. With increasing age, the results of the boys improve in relation to girls (G. and L. Erickson 1982; Johnson and Murphy 1986; Lie and Sjoberg 1984; Murphy and Qualter 1986).

The boys' advantage in technical tasks is attributable to earlier experience in using technical equipment. Experience also contributes towards success in tasks requiring spatial configuration. (Johnson and Murphy 1986; Lie and Sjoberh 1984; Paulsen 1984; Whyte 1986). The performance differences in school performance tests in the understanding of concepts are related to the contents and contexts of the individual tasks, i.e. again to experience. Even confidence in one's own ability to solve a certain task depends on the familiarity of the context of the task to the boys or correspondingly to the girls (Murphy and Qualter 1986).

In the following I will explore learning of physics concepts in the light of Lev Vygotsky's (1962) theory of learning of scientific concepts.

Vygotsky distinguishes between everyday or spontaneuous concepts and scientific concepts. Everyday concepts originate in the child's personal experience, scientific concepts are learned by instruction primarily at school.

"One might say that the development of the child's spontaneous concepts proceeds upward, and the development of his scientific concepts downward, to a more elementary and concrete level." (Vygotsky 1962, 108). "As the two meet they penetrate and transform each other." (Engeström 1987, 238)

The two processes are closely connected. The development of a spontaneous concept must have reached a certain level for the child to be able to absorb a related scientific concept.

The child has to work hard to construct a scientific concept. In working its slow way upward an everyday concept clears path for the scientific concept and its downward development. It creates a series of structures necessary for the evolution of a concept's more primitive, elementary aspects, which give it body and vitality. In this process the child becomes for the first time conscious of everyday concepts which enables generalization and control of them. According to Vygotsky a system of scientific concepts do not enter the child's mind from outside sweeping away existing elementary concepts but require a relatively ample and developed variety of spontaneous concepts to become suject to consciousness and systematization. (Vygotsky 1962)

As demonstrated by many writers girls have a poorer supply of of technical and other useful experience and knowledge applicable in physics classes (Hoffmann and Lehrke 1985; Lie and Sjoberg 1984; Sorensen 1985). Applying Vygotsky's theory we can conclude that the quality and quantity of girls' everyday concepts in the area of "downward development" of the scientific concepts in physics does not reach to a level needed in good learning of scientific concepts. This would leave the structure of physical concepts fragmentary, and weaken the application and the generalizing power of concepts.

The signicance of imitation in learning

Collaborative imitation and instruction are crucial for the development of the child's thinking. The question is of imitation in the sense that the child does not himself invent the concept but tries to adopt an already developed concept by constructing is her/his mind a concept that is the object of teaching. (Vygotsky 1962)

What is the relation of "imitation", as used by Vygotsky, to "memorizing", which is said to be typical especially of girls? Vygotsky does not discuss this, but I understand it in the following way. With Vygotsky, the learning result is composed of imitation and becoming conscious of previously adopted concepts at will and working them up. In "memorizing" becoming conscious of one's own thinking and working it up remains undone, the pupil does not "think her/himself". With Vygotsky, "imitation" is an active, results-yielding component of learning while "memorizing" reflects a passsive attitude towards the thought contents to be adopted. If there are no everyday concepts in the area required in thinking, they naturally cannot be made conscious or caanot be worked up. Learning then depends on the skills of the teacher and the time available for creating the necessary experiences in the teaching situation. If the teaching of physics is based on everyday concepts unknown to girls, the "imitation" may become narrowed to studying of empty forms, or "memorizing".

Deficiencies in everyday concepts do not necessarily lead to memorizing. The pupil may supplement her/his incomplete everyday concepts by acquiring additional information, with the aid of which the learning will be successful. This presupposes additional work. In teaching at the abstract level or in teaching, which advances from theories and scientific laws "downwards" toward the phenomenon, the danger is much greater than in teaching advancing from phenomena to concepts.

Cognitive and affective conflict

Vygotsky's criteria of scientific concepts are: They are included in a conceptual system, the learner is conscious of them, and they are acquired through instruction. V. V. Davydov points out that these characteristics do not relly differentiate the spontaneous and genuine, scientific concepts. Even everyday concepts may fulfill these criteria. (Engeström 1987, 239) What then is the spesific content of a scientific concept?

"Genuine concept formation and conceptual thinking ascends first from the perceptually concrete phenomena to the substantial abstraction, the 'germ cell' which expresses the genetically original inner contradiction of the system under scrutiny. It then proceeds to concrete generalization by deducing the various particular manifestations from this developmental basis." (Engeström 1987, 245, referring to Davidov)

In what way does a new, qualitatively more developed concept, or activity originate from the old?

Applying Davidov Engeström presents a cycle of expansive transition. Learning activity starts with a need state inside a system, in an explanation, or an activity. The second stage contains an analysis of the situation which brings about conflicting elements of the old activity and leads to a double bind. The third phase begins with finding a specific new instrument which functions as a springboard for breaking the constraints of the double bind. In the third phase a modell is constructed for a new activity or a new scientific concept. The remaining two phases consist of application and consolidation of the new activity. (Engeström 1987)

According to the cultural historical school the task of the orientation phase of instruction is to create a strong motivation for learning by construing a need state and a double bind in the mental activity of the learners i.e. a cognitive conflict.

Beyer et al. (1987) criticize this view and state, on the basis of their teaching experience, that girls avoid intellectual challenges more often than boys and resort to what is known to them. The barrier to learning physical concepts in girls would thus not be mere lack of the necessary everyday concepts, nor the absence of sufficiently strong cognitive conflicts in school teaching, but the reluctance to treat the cognitive conflict.

Next we have to ask what "avoidance of intellectual challenges" or "reluctance to treat the conflict" mean from the point of view of the learning process. Beyer et al. emphasize the emotionality of the problem-solving situations. A cognitive conflict mobilizes a person's emotions and, in its connection, one can speak of a crisis (also Engström). These unpleasant emotions must be overcome - throwing onself into a confict-solving situation means taking a risk (Beyer et al. 1987). One must also be able to work so long and so efficiently that a new concept is created, a new model is found.

Beyer et al. postulate that the will to take a risk is related to learning style, namely autonomy in learning. (Above 119). They refer to Fennema and Peterson (1985), who maintain that a person whose learning style is characterized by autonomy acts in the following way:

The learner (1) works independently with difficult cognitive tasks, (2) chooses independently a working method like this, (3) is strenuous, and (4) feels she/he is making success when using this working method.

According to Fennema and Peterson, boys more frequently than girls develop an autonomous studying style. Reasons for this at two levels are distinguished: (1) "internal motivation structure", which includes the skills related to the subject, an opinion that the subject is useful and the so-called attributive style; (2) external social effects, such as parents, peers, media, teaching and the teacher-pupil relationship. (Op. sit. by Beyer et al. 1987)

The term "learned helplessness" is also used of the girls' and women's attributive style. The kind of education, in which a determinant and direct attempt at mastering the situation is reinforced, would lead to learned helplessness. This would lead to conflicting deeds and emotions regarding the interference with and avoidance of situations, problems, etc. (Larsen 1984) According to Larsen, the teaching of helplessness takes place at puberty and after puberty, which would cause a reduction in the girls' self-confidence during this period.

Fennema's and Peterson's definition about the autonomous learning style is descriptive and does not state what is essential in autonomy. A useful analysis of the autonomous learning behavior can be found from Erno Lehtinen (1986). He has presented a model of three different kinds of studying style in mathematics.

(1) In the task-oriented learning style the learner independently builds up an internal model of the object of learning. When the teaching starts, the learner makes the first rough outline knowing it to be inaccurate and she/he supplements and corrects it continuously in the course of the teaching. She/he uses the teacher as a means of learning, having, however, her/himself assumed the responsibility for learning.

Characteristic of the second learning style is that the learner gives the responsibility for the learning to the teacher. She/he expects the teacher to clarify the matter so thoroughly that she/he can adopt it as such. Lehtinen calls this the dependence-oriented learning style. In my opinion, the question is of "memorizing" type studying, whose affective basis, i.e. dependence, Lehtinen shows. I have earlier said that "memorizing" is partly due to the lack of everyday experiences necessary for the understanding of the matter. Lehtinen shows another reason for memorizing, dependence on the teacher, learning material, etc. In the teaching of the girls' physics, both of these factors may be intertwined: insufficiency of everyday experience increases dependence on the teacher.

Lehtinen calls the third learning style egodefensive. The learning process is damaged to the extent of being useless because of scaredness of the learning situation. The pupil concentrates her/his forces on managing the social situation. She/he cannot, for example, concentrate on learning in the presence of adults. Left alone, the learner may use either of the above-mentioned learning styles.

Creating a new Gestalt, leaning a new concept, presupposes the use of intuition and imagination, e.g. the use of analogies. They are related to autonomous learning only.

Let us once more examine the task-oriented learning behaviour presented by Lehtinen. It includes following of teaching, in the Vygotskyan sense imitation. Already at the initial phase the pupil hastens to outline in her/his mind generally the object to be learned as a whole, to anticipate "what it is all about". When the teaching progresses, she/he adjusts every new component into her/his general outline and revises the outline according to the information contained by the component. This process presupposes both intuition, or a certain kind of anticipating outline, in the creation of which imagination and previous experience have crucial significance, and furthermore more tightly logical processes. In the process of learning, which is characterized by uncertainty, intuitive outlining has an essential significance. Learning can be regarded as a step from an earlier insufficient concept system to a more developed, reorganized and supplemented system.

Conclusion

I will now present the factors affecting the motivation and the capacity of learning physics concepts as two variables. The ample evidence for the first variable is not dealt with in this article but taken for granted.

1) The first deals with the personal significance of physics for the pupil. It is great, if physics is needed for realization of professional plans. Its importance may also emerge from a intellectual interest in physics or, it may serve the sense of masculine identity. The personal importance of physics is weakened if it is nol a part of professional plans or hobbies or not regarded essential for building up world view.
2) The second variable stands for the learner's confidence in her/his own learning skills.

Considering the effects of both variables we get the following table:

Table 1. Factors affecting learning capacity of physics concepts

		Personal significance of physics	
		Great	Small
Confidence in learning skills	Strong	1. Autonomous learning style	2. Relaxed learning style
	Poor	3. Affective conflict	4. Poor motivation

The pupil's motivation in the different combinations can be described as follows:

Such pupils are positioned in square 1. for whom physics has a great personal significance, e.g. they have a wish to advance to a technical profession and trust their learning skills. These pupils are likely to select in senior secondary school extensive physics and they are mostly boys. This group also includes girls with a strong trust in their learning skills. They will develop an autonomous learning style. The concept of the cognitive conflict of the cultural-historical school which arouses a need to solve the conflict, is well suited to this group.

Square 2. includes the pupils who trust that they learn physics but who feel that they do not need it. If a girl, she is not likely not to concentrate on physics very much, especially in senior secondary school. If a boy, he may study physics and adopts an autonomous, relaxed or indifferent style.

The most interesting group, from the point of our theme, consists of those belonging to square 3. who neeed physics but do not trust that they manage it. Here are positioned e.g. the senior secondary school girls described by Beyer et al. in whom the cognitive conflict creates an affctive conflict impeding learning. On the one hand there is a pressure for good performance, on the other hand the pupil is afraid of failure. The conflict weakens the resources avaibale for learning.

Square 4) comprises the pupils for whom studying physics is not personally important and who also believe that they would not make it. At the stage where physics becomes optional the pupils positioned in this square drop it. The majority of these pupils are girls. The cognitive conflict "offered" by the teacher does not arouse motivation in this group.

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I REFLECTIONS ON GASAT WORK IN THE FIELD OF EDUCATION AND SCHOOLING

5 Access to engineering education

A NEWLY FORMED INTEGRATING EDUCATION.

PROFESSOR ERIK ANDREASEN.

COPENHAGEN COLLEGE OF ENGINEERING.

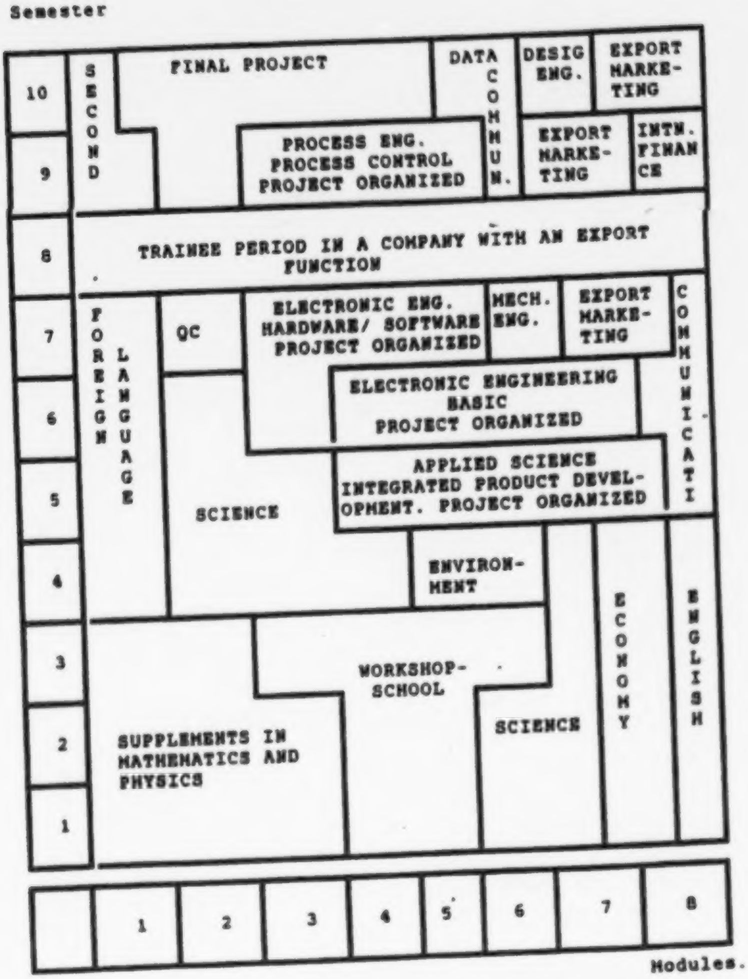
The following factors motivated the Engineering College of Københavns Teknikum (KT) to develop a new education named Export Engineers.

- Danish industry's pronounced demand for personal to step up efforts in the export sector.
- The wish to utilize the language qualifications of graduates from the modern languages branch of the Danish gymnasia in new fields.
- The wish to educate more women as engineers.
- The interest expressed by the Danish Ministry of Education in a joint educational initiative involving KT and the Copenhagen School of Economics, Business Administration and Modern Languages (HHK).

A number of educational aspects had to be considered, including:

- The feasibility of establishing a coordinated and integrated course of education combining elements from engineering and business educations? Traditionally, these educations are very different in theories and methods in Denmark.
- The feasibility of coordinating and integrating these elements in such a way that the qualification level attained will be considerably higher than that attainable through an education in which the engineering and the business elements are taught consecutively.

PRESENT STRUCTURE.


Semester
10
9
8
7
6
5
4
3
2
1
SECOND
FINAL PROJECT
DATA COMMUN.
DESIG ENG.
EXPORT MARKETING
PROCESS ENG. PROCESS CONTROL PROJECT ORGANIZED
EXPORT MARKETING
INTN. FINANCE
TRAINEE PERIOD IN A COMPANY WITH AN EXPORT FUNCTION
FOREIGN LANGUAGE
QC
ELECTRONIC ENG. HARDWARE/ SOFTWARE PROJECT ORGANIZED
MECH. ENG.
EXPORT MARKETING
COMMUNICATI
ELECTRONIC ENGINEERING BASIC PROJECT ORGANIZED
APPLIED SCIENCE INTEGRATED PRODUCT DEVELOPMENT. PROJECT ORGANIZED
SCIENCE
ENVIRONMENT
ECONOMY
ENGLISH
WORKSHOP-SCHOOL
SCIENCE
SUPPLEMENTS IN MATHEMATICS AND PHYSICS
1
2
3
4
5
6
7
8
Modules.

One semester equals 8 modules study of each 56 hours lecturing.

TEACHING METHODS.

The student, 80% women, comes to the Export Engineer Education with a background from a modern language gymnasium. This means that we have to give them supplementary courses in mathematics, physics together with workshops, which gives them a more practical background. This involves letting the students getting acquainted with the technical world, its theories, its methods and the way it is practiced.

The teaching methods has to be different to the ones employed towards mathematical students because of the students background.

Traditional teaching methods are employed in the first four semesters. 20-30 students forms a class. Theories and methods are lectured by a teacher, and the students have to solve selected problems at school and at home. There are laboratory work, where the scientific theories and methods are taught and practiced. The teachers emphasize the way scientist works. The experimental method is in focus.

We find it very important to teach the students the differences between the sciences. The difference in methods used. The integrated aspect of the education makes this necessary.

In the following semesters we use a mixture of traditional teaching methods and project organized teaching methods. Every semester contains a project integrated several subjects taught in the actual or previous semesters.

The project is interdisciplinary and the subject often chosen by the students. The initiative is in a much higher degree given to the students. They have to find relevant problems, and to choose a relevant problem solving method(s) under the guidance of their teacher(s).

In the projects the following structure is used:

Theory(es)	Theory(es)	Project
Method(s)	Method(s)	
Problem Statem.	Project.	

RESULTS.

The number of applicants has been increasing since the start in 1985. The yearly intake is 180 students, 90 starting in the summer and 90 starting in the winter.

Positive feed-back has been given by the firms that are employing export engineers.

The process of readjusting from the language branch of a gymnasium to the export engineering education may seem as an overwhelming experience because of the emphasis on science and technology but the applied teaching methods seems to have been reasonable successfully.

A CASE STUDY OF WIDENING ACCESS TO CONSTRUCTION HIGHER EDUCATION.

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Abstract.

The construction industry faces an increasing national shortage of highly qualified construction personnel and is aware of "the effect that the diminishing teenage population is going to have on recruitment in the future" (Lighthill Report, 1986).

Women make up only about one twentieth of the professional and trade workforce in construction. On Polytechnic and University construction courses they form less than 7 and 12 % of students respectively (Gale, 1989).

So, "while this imbalance deprives the industry of a great untapped pool of talent, it also deprives women of rewarding career opportunities and, moreover, it produces a built environment planned, designed and built predominantly by males" (Fryer and Srivastava, 1991).

The author has carried out a study to identify:-

-the specific barriers to women entering construction Higher Education.

-the culture and image of the industry which is portrayed to schools, Colleges, careers advisors, teachers and parents.

-the role of Higher Education in enhancing the recruitment of women and as a link between schools and industry.

The case for using qualitative analysis in such research is made. The depth of insight gained from such data collection is illustrated with personal accounts given in face to face and group interviews with school students, polytechnic staff and students, Construction employers and women in construction.

The paper will highlight some common themes identified in interviews with Polytechnic staff and students, industrial personnel and school students which have lead to the development of the following hypotheses :-

-women face a variety of barriers entering male dominated areas, such as construction.

-the culture and image of construction presents a barrier to womens participation.

-Higher education does not facilitate access to under-represented groups.

LITERATURE AND THEORY

The under-representation of women in construction is a social phenomenon and has to be related to social theories. The concepts of gender relations and hegemony, organisation culture and change and access and equal opportunity in HE were used to explore the hypotheses. Marshall (1984) argued that "Western society is essentially a patriarchy...inequalities are reflected in our social institutions, in the distribution of work". David-Krell (1989) illustrated this stating that "girls are socialized quite differently from boys by parents, the media, society and even schools" . In particular, "forces within the schools tend to work against the sciences, particularly for girls" (UGC, 1984).

Work carried out by the Construction Industry Training Board (CITB) (1990) illustrated how the image of the industry influenced parents and their childrens' views and lack of information contributed to the effect of steering girls away from construction. In addition Gale (1990) highlighted "the powerful and essential influence of gender inclusive curriculum in schools and Higher Education". The Chartered Institute of Building (CIOB) (1989) also recognised that "the needs of the industry will be met only if access to Higher Education can be widened". HE Institutions have "reaffirm(ed) the importance of access and the provision of opportunity" (University Grants Committee, 1984).

Beechey and Whitelegg (1989) argued that "Despite the fact that women are not formally precluded from entry into many occupations in contemporary Britain, there is still a pronounced form of division of the labour market. That is, there is a pronounced form of occupational segregation". Cockburn (1985) maintained that scientific and technical work had become synonymous with masculinity and Carter and Kirkup suggested this gendered occupational stereotyping was perpetuated within professions. Greed (1991) asserted that "changes must be made in professional organisational structures to the advantage of women in order to facilitate the 'coming through' of alternative people and values".

METHODOLOGY

The research process involved a multi-method approach and included a case study, action research and networking, including participant observation, interviewing, experimental approaches and questionnaires, as shown below.

CASE STUDY
POLYTECHNIC POLICIES AND PRACTICES
POLYTECHNIC ACCESS AND EO STAFF
DEPARTMENT POLICIES AND PRACTICES
DEPARTMENT STAFF
COURSES
STUDENT DATA
WOMEN STUDENTS

NETWORKING
LITERATURE
KEY RESEARCHERS
RESEARCHER ——— ACCESS ORGANISATIONS
OTHER EDUC. INSTITUTIONS
OTHER DISCIPLINES
WOMENS' ORGANISATIONS

ACTION RESEARCH
WOMEN IN CONSTRUCTION
SCHOOLS
CITB, INDUSTRY

Fig.1 Areas of investigation

A qualitative approach allowed rich data to be collected giving an insight into reflective and retrospective views of construction HE. Participant observation within Leeds Polytechnic's Built Environment department gave an insight into the processes, formal and informal, which affect the culture of the department. Networking enabled familiarisation with construction, access and gender issues locally and nationally. The wide variety of sources of data and multi-method approach to collection gave many perspectives. Questionnaire surveys will provide a more comprehensive representation of the situation with which to test the hypotheses.

Many strategies were available to respond more effectively to the needs of women students by reassessing policies and practices and taking a pro-active approach to access and equal opportunities. However, the Built Environment department had not taken the opportunities open to them to be part of the access movement.

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HIGHER          POLICIES           POSITIVE       WIDER
EDUCATION---->PRACTICES------->ACTION     ---->ACCESS
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Fig.3 The role of Higher Education in widening access.

Barriers faced by women

Disscussions with women students and women construction professionals revealed that traditional attitudes towards male and female roles, abilities and aspirations resulted in women being steered away from construction even if they had shown an interest. Perceptions of construction were found to be affected by the lack of role models, such as female construction lecturers, students and professionals. Women were generally given fewer opportunities to gain the right experience and their different backgrounds made them lacking in confidence to apply for courses for which they were qualified.

While women students had not known what career they did want they felt they did not want a traditionally 'female' career. Careers advice given to many of the women students was on traditional female jobs with no mention of opportunities in construction and related areas, a sort of blind spot to the industry.

Some women students felt excluded by the terminology and language used by tutors. There was always pressure to prove themselves on the course and especially on placement. Students felt too vulnerable to complain about poor industrial training and felt it would only serve to isolate them. Perceptions of courses were more positive with the existence of role models such as women lecturers and students. Students felt women tutors were valuable in terms of giving support and confidence and for contact with difficulties on placement. It was also felt that the representation of women on the staff would improve the image of construction courses.

Interviews with women construction professionals highlighted the need to raise the profile of women in construction and create networks of local support for women in the industry.

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         SOCIALISATION    KNOWLEDGE      TRADITIONAL
WOMEN--->              --->           --->OCCUPATIONAL
          EXPERIENCE      ROLE MODELS    CHOICE
```

Fig.4 The processes leading to women's traditional occupational choice

INTENDED FURTHER WORK

Interviews and questionnaires will test the findings from the first phase of the research and will establish patterns occurring in construction HE. Experience gained from the case study indicated that small scale research methods were most appropriate for collecting data which may be contain contradictions in ideas and perceptions of situations, between different groups.

Data from the case study, interviews and questionnaires will be categorised to identify patterns in responses. Insight gained from this data will be used to establish relationships between the concepts of hegemony, access and organisation culture in construction HE. Statistical analysis of the interviews and questionnaires will use non-parametric tests and analysis will be by the minitab statistical software package.

```
                 CULTURE OF
                 CONSTRUCTION
                       |
INSTITUTIONAL          DOMINANT
AND DEPARTMENTAL--->CULTURE OF       --->TRADITIONAL STUDENT
CULTURE                TRADITIONALISM
```

Fig.2 How organisational culture affects widening access.

The role of Higher Education

HE departments were seen as having the capacity to be flexible, adopt changes and develop models of equality of opportunity for women and men. Discussions with Polytechnic and departmental staff illustrated the scope for adopting pro-active policies and practices to widen access, including:-

Collection of data on student applications, numbers and progression

Enhancing support, progression and representation of women students.

Improving the recruitment methods and progression of women staff

Staff awareness training for all staff and specific training for admissions tutors

Reduction in irrelevant and excessive maths content

Inclusion of equal opportunities in management courses.

A foundation course targeting non-science school leavers

An access course feeding into all Built Environment courses

Use of modularisation for flexible provision

Working links with equal opportunities personnel

Use of Polytechnic Credit Accumulation and Transfer Scheme (CATS) and Accreditation of Prior Learning (APL).

Collaboration on initiatives with schools and industry

Improved recruitment literature

Wider dissemination of course and careers information.

Incorporation of access strategies within an overall strategic plan

Monitoring of access strategies using institutional and departmental data

FINDINGS

Construction Higher Education culture.

Data from a sample of 5 Polytechnics established a clear pattern of under-representation of women on construction courses.

COURSE	% WOMEN STUDENTS
HNC/HND Civil Engineering	10.5
HNC/HND Building Studies	6.0
Bsc. Building/Construction	5.0
Bsc. Quantity Surveying	12.5
Bsc. Building Surveying	12.0
Beng. Civil Engineering	12.5

Fig.1 Representation of women on construction courses.

Construction, as a vocational discipline, was a relative newcomer to the professional arena with strong industrial influences upon it. Its traditional nature meant it was slow to perceive the need for change and slow to react even when the need was recognised. The professional institutions had introduced initiatives to encourage women but these were low profile, fragmented and ad hoc.

The case study focused on access and equal opportunities issues. While widening access was a priority for the Polytechnic the Built Environment was one of the last to respond to the ethos of widening access. Access and equal opportunities policies were not always translated into practice. Responses from managers suggested a commitment to access while responses from lecturing staff indicated a lack of understanding and a degree of apprehension towards widening access. As Handy (1986) pointed out " even within organisations culture will differ". Institutional support and a programme of staff development on access issues with changes implemented through existing channels, was needed to shift the culture.

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GENDER ISSUES IN MASTERS PROGRAMS

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During past decades the numbers of female university students have increased remarkably. Although female participation is nearly fifty percent, gender differences have not disappeared altogether. In some beta-disciplines the number of female students keeps lagging behind. In this paper differences between female and male students, and among female students themselves are considered a product of interaction between agent and social system. A process of 'twofold reproduction' takes place, in which university education is produced together with gender. Specialization as a property of education works out differently in female and in male students: women are expected to make other choices than men, when composing masters programs. Coeducation works out discriminating as well. In case of varying gender minority rates, for example in technical disciplines, double standards are expected. Here quantatative material on masters programs at Wageningen Agricultural University in the Netherlands is studied, within a theoretical framework of 'engendered structure'.

Introduction

In 1982 Dutch university education was radically restructured. Programs have been reduced from six to four years and possibilities to differentiate have increased. Government expects the new organization of tertiary education to have a positive influence on women's emancipation, because of its opening up various ways to individual tailor-made combinations of subjects. In a critical assessment of government policy Van Eck and Veeken (1984) question the new law's beneficial effects. When in high school female pupils 'lag behind', making gender specific choices, in university education this could be expected as well.

In past decennia at the Dutch universities the number of female students has increased. Overall figures show a female participation rate of nearly 50%. Changes in numbers are accompanied by shifts in interest. Did women show an unambiguous preference for alpha and gamma disciplines in the past, nowadays medicine, biology and agricultural sciences are popular as well. Generally taken, findings on high school seniors show that of those with grades in mathematics, physics and chemistry the proportion of women opting for sciences is as high as men's. However for technical and pure sciences it is lower, gender differences being related to higher grades for beta-subjects. Moreover, high school seniors also differ in reasons for selecting a field of study: females more often mention social motives than males do (Dekkers 1990).

Social motives play a part during and after university education. At Wageningen Agricultural University (WAU) female students. They seem eager to do optional courses, and to slant their studies towards the social sciences (Bolt 1991; Wolffensperger 1992). Once graduated, female agricultural engineers participate in social sectors of the labour market, while males can be found in jobs with a technical and economic connotation (Bos-Boers 1992). In agricultural sciences gendered choices seem to prevail.

Theory

Human activities are products of a recursive relationship between agent and social system. Individual qualities and characteristics of a certain context are mutually affecting each other (Giddens 1979, 1984). The reciprocity relationship between actor and context is a twofold one, which I have named 'engendered structure' (Wolffensperger 1991). Gendered rules and resources should be conceived of as media of 'twofold reproduction': institutions, and gender inequality are reproduced simultaneously. The reciprocity of actor and context can be studied at the level of 'real' activities (between pupils and teachers), *and* at an abstract level of institutional features (coeducation and specialization).

The concept of engendered structure opens up possibilities to study female/male differences at two levels. In the everyday classroom coeducation as a system property enables teachers to differentiate between female and male pupils; to apply stereotypes and to use double standards. In technical and pure sciences classes coeducation leads to female minority rates, opening up possibilities for gender based stereotyping and double standards.[1] Coeducation enables others to make a difference. When education is studied at an institutional level, related to specialization as a system property differences of female and male pupils evolve. At system-specific moments pupils have an opportunity to choose: according to gender stereotypes or not. Specialization enables pupils themselves to make a difference. Both coeducation and specialization turn out to have different impacts for female and male pupils.

Elsewhere (Wolffensperger 1992) I have analyzed *female students' perceptions* of studying at Wageningen Agricultural University. They are critical of the contents of masters programs, and the behaviour of lecturers. They feel not being taken seriously, being treated as women and not as future engineers or colleagues. To reduce tension students are maximizing free choice space and selecting optional courses in social sciences. They also tend to keep a low profile or, on the contrary, to perform well. Kanter (1977) has proven performing well and keeping a low profile to be general strategies, used for coping with gendered double standards and stereotyping. With increasing minority rates the use of double standards and stereotypes decreases, and so does the need for coping strategies.

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[1] Moss Kanter (1977) has developed a theory majority/minority ratio's, stating that activities, abilities and achievements of a minority tend to be interpreted in terms of socially accepted behaviour. When a minority rate surpasses 33%, these social processes diminish. Minority coping-strategies are: to make oneself invisible or excellent performing. Ott (1985) has found that a lower status minority will suffer, whereas a higher status minority will benefit from its exceptional position.

In this paper the object of study will be the *reciprocity relationship* between female and male students' activities (female students being the standard) and specialization and coeducation as gendered properties of university education. Following this theoretical framework, differences between female and male students are to be expected, but also between female students themselves because of varying minority rates.

Wageningen Agricultural University and its students

In the Netherlands university education lasts for four years: one introductory year plus a three years masters program. In both periods students are allowed to take one year extra, without endangering their grants. The possibility to extend studying to six years, students may differ in period of studying, and in number of hours studied.

Wageningen Agricultural University is unique, because of its special relationship to agriculture -in its natural and social context. Since WAU is a true hybrid of science and technology, pure and applied, only high school graduates having done their A-levels in mathematics, physics and chemistry have access. There are five one-year introductory courses, each of them opening up to several masters programs. A masters program consists of obligatory, a semi obligatory and optional courses: basic-program, orientation program and free choice space. A great differentation in masters subjects can be expected, because of students' specialization via masters program, orientation and use of free-choice space. The student population amounts to 6000, 43% of which is female. Women and men are unequally distributed; in several masters programs female students are easily outnumbered by males.

The gendered reciprocity relationship between students' activities and specialization and coeducation will be studied via data on student choices of masters programs, and on the contents of masters programs, available at WAU university administration.

The following questions are related to gendered specialization processes: Are there differences between female and male students in choices of masters programs and of masters subjects? Do male students make use of free choice space as much as female students do? Is there a difference between females and males in selecting social science courses?

Related to gendered coeducational processes are questions on differences in hours studied, numbers of hours invested in masters subjects, and contents of free choice space, to be answered for females/males and for categories of females. Performing is measured via number of hours studied, and hours invested in masters subjects. Keeping a low profile -defined as acting conform male standards- is measured via number of hours studied and contents of free choice space. I have divided female students in three categories (based on female rates per masters program), to test this relationship.

Distribution of students

An analysis has been made of data on masters programs and subjects, of the student population graduated from WAU in september 1991.[2] The population is 483, 192 females (43%) and 290 males (57%), which is half of the proportion of graduates per year. In figure 1 the female and male participation in masters programs is given.[3]

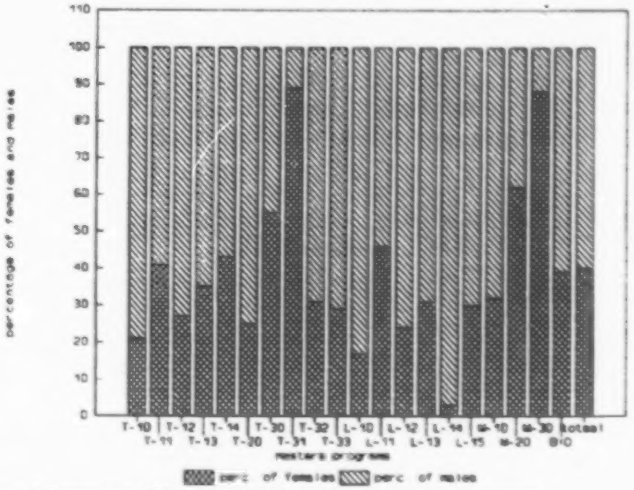

Figure 1 Percentage of female and male students per masters program.

Female students are unevenly distributed within WAU, but during the past twenty years differences in female/male participation have been diminishing in most masters programs . Only agricultural engineering (L-14) shows a consistently low participation of women, whereas other programs know a steady increase of females. In 16 of 20 masters programs female participation is between 20 and 62 percent.

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[2] Data have been manufactured into meanscores, frequencies and figures by Elsbeth Bolt.

[3] The following programs can be distinguished:

T10	Field crops	T31	Human nutrition	L14	Agricultural engineering
T11	Tropical crops	T32	Environmental sciences	L15	Soils and fertilizers
T12	Horticulture	T33	Molecular sciences	M10	Agricultural economics
T13	Plant breeding	L10	Forestry	M20	Rural sociology
T14	Plant pathology	L11	Landscape architecture	M30	Home economics
T20	Animal production	L12	Land and water use	BIO	Biology
T30	Food technology	L13	Tropical land and water use		

Female rates have provided a base for categorizing female students. Category I consists of masters programs with rates up to 30%, and covers 21% of the female population; category II consists of programs with rates between 30-40%, and covers 27% the female population; category III consists of programs with rates between 40-62%, and covers 25% of the female population; category IV consists of programs with rates higher than 62, and covers 27% of the female population.

Hours studied

After five years 15% of the women and 14% of the men have graduated. After six years the percentages are 92% and 88% respectively. In figure 2 differences in number of hours studied can be found: a program of at least 7500 hours is completed by 56% of female students and male students this is 46%. Moreover 72% of females and 60% of males is studying at least 1000 hours a year. Females work harder.

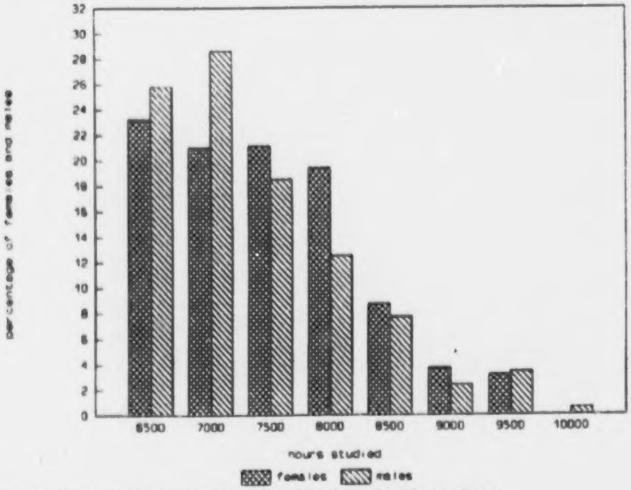

Figure 2. Number of hours studied for female and male students.

For the avarage female and male student the difference of hours studied is 200; of hours invested in masters subjects the difference is 100. For of studying and investment of hours in studying (and in majors) gender differences are found: females students perform better than males.

How about differences among female students themselves? Here the number of hours invested is used to gather information on performance and on keeping a low profile for categories of female students. When female rates increase, the number of hours studied and number hours invested in masters subjects (majors) is expected to decrease. Three categories of female students have been studied, categories being based on female participation per masters program (I up to 30%; II 30-40%; III 40-62%).[4] An inverse relationship is expected between hours invested and increasing female minority rates.

hours studied	category of masters programs			row total(%)
	I	II	III	
6620-7400	20.0	30.8	42.9	32%
7401-8250	32.5	36.5	24.5	31%
8251-10820	47.5	32.7	32.7	37%
column total(n)	40	52	49	n=141/100%

Table 1. Number of hours studied per category of masters programs

hours in majors	category of masters programs			row total(%)
	I	II	III	
1200-2200	30.0	36.5	32.7	33.3%
2201-2700	27.5	32.7	38.8	33.3%
2701-5720	42.5	30.8	28.6	33.3%
column total(n)	40	52	49	n=141/100%

Table 2. Number of hours invested in majors per category of masters programs

In both table 1 and 2 female students study more hours and invest more time in majors when their rates are low, than when their rates are high. The pattern however is not is not convincing.

Keeping a low profile, or acting conform male standards is measured via differences in hours studied between female and male students. When female rates increase, differences in number of hours studied and of hours invested in majors are expected to decrease.

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[4] Category IV has not been used because Ott's findings, see note 1.

category of masters programs	hours studied			hours in majors		
	women	men	difference	women	men	difference
I	8181	7955	226	2608	2486	122
II	8004	7686	318	2512	2339	173
III	7763	7760	3	2418	2401	15

n=483 female=193 male=290

Table 3. Hours studied and in hours invested in majors by average female and male students

Table 3 is ambiguous. With increasing female rates, differences in hours of studying and in majors between female and male students decrease, but for category II. As is the case in table 1 and 2, category II disturbes the overal relationship.

Free choice space and social science courses

Differences in tempo and number of hours having been discussed. Here data on the use of free choice space and the selection of social science courses will be analyzed.

In the use of free choice space and the selection of social science courses differences are expected for female and male students. For female students a positive relationship is expected of increasing female participation, and differences between female and male students in both cases. Female students no longer need to keep a low profile; consequently they are expected to maximize free choice space, and to choose social science courses.

category of masters programs	maximizing free choice space		
	women	men	differences
I	18%	21%	-3%
II	40%	26%	-14%
III	25%	26%	-1%

n=113 female=53 male=60

Table 4. Percentages of females and males maximizing free choice space

As is the case for numbers of hours studied, the relationship between increasing female rates and maximizing free choice space (table 4) is hardly convincing. Patterns are disturbed once again by students from masters programs with female rates of 30-40%.

selection of social science courses hasocial science courses

category of masters programs	social sciences courses as a proportion of hours studied				
	0-5%		>6%		absolute differences
	women	men	women	men	
I	29	82	71	18	53
II	53	64	47	36	11
III	45	60	55	40	15

n=113 female=53 male=60

Table 5. Proportion of hours in social sciences optional courses, for students maximizing free choice space

A comparison between female and male students for proportion of social science courses taken has been made for those who take up to 5% of hours studied in social science courses, and for those who take over 5%. (Here preference for social science courses is less disturbed -semi-obligatory courses.) When the left and right side of table 5 are compared it becomes clear, that differences between women and men in selecting social science courses are greater when students have allocated over 6% of hours studied to social science courses. It seems to indicate that women more than men tend to use their free choice space for selecting social science courses.

To get a better insight in individual students' choices, all WAU courses have been categorized according to cluster. It then is possible then to make comparisons for students doing courses within a certain cluster. WAU is organized in 12 clusters, responsible for educational programs and courses. In figure 3, for the total student population (193 females and 290 males) percentages doing courses within a certain cluster can be found. The percentages of women doing courses are found at the left side, while percentages of men are found in the third part from the left of each of twelve combination-columns. Within most combination-columns differences between female and male students are found, due to gender based specialization.

To eliminate biases due to obligatory and semi obligatory courses, additional data have been gathered for those females and males maximizing free choice space: 53 females, 31% of the female population; 60 males, 23% of the male population. Data can be found in the second and fourth part of each combination column.

In comparing all females with those who maximize free choice a backfall is found in cluster 5 (zootechnics), 8 (mathematics and physics) and 10 (molecular sciences). Similar decreases are found in males.

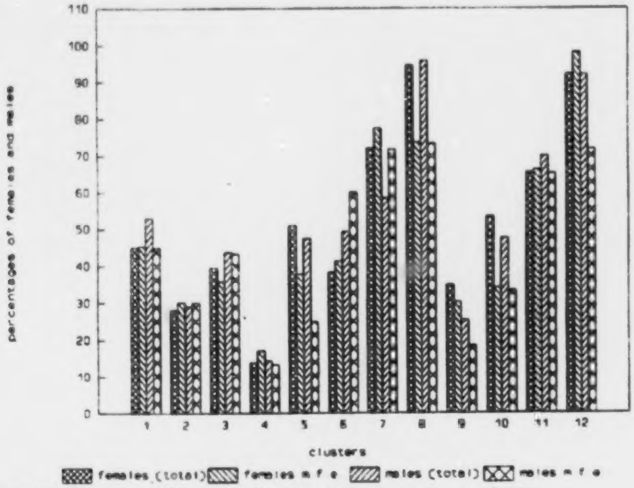

Figure 3 Frequences of females and males, doing courses, per cluster.

For females an increase is found in social sciences, while quite a decreas is found her for males. For males an increase exists in cluster 3 (plant protection), cluster 6 (land use) and cluster 7 (soil sciences and environmental technology). Cluster 5 and 7 also show an increase for females, be it less remarkable.

Discussion

In this paper research questions derived from the reciprocity relationship between students and university education has been object of study. Questions on female/male related to specialization have been ansewered positively. Female and male students behave differently: in choosing masters programs (figure 1) and masters subjects (fig.3); in using free choice space (table 4, fig.3); in selecting social science courses (table 5, fig.3).

Questions related to coeducation are less unequivocal. Performing well has been measured by the inverse relationship between rates of female students per masters program, and number of hours studied. Keeping a low profile has been measured by the relationship between rates of female students acting conform male standards for number of hours studied and maximizing free choice space. For all questions, findings are contradictory, disturbed by deviating data in category II, where female rates are between 30 and 40%. This category includes several masters programs, of which the students are well known for their political awareness and critical attitude towards single mindedness in science and technology; among them Tropical land and water (L13) use and Environmental sciences (T32). These attributes may have disturbed the expected patterns. Altogether, hypotheses about performance and invisibility need further exploration.

Finally, the reason why females from low-female-rate masters programs who maximizing free choice space also score high in social sciences courses, might be found in their being through with science and technology. May be they drop out from their masters program. When the extent of optional choices at WAU would be less, those female students might drop out altogether.

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VOCATIONAL AND TECHNICAL EDUCATION IN POLAND WITH PARTICULAR STRESS ON AGRICULTURAL SCHOOLS

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Poland is one of the central-east European countries where deep political, social and economical changes have taken place for the last two years. Poland "has opened" to the world. Proprietary relationships have been changed gradually but systematically - privatization and reprivatization take place. All the above mentioned facts have also caused necessity to introduce significant program and organizational changes in the reforms of educational system. First of all the aims of vocational and technical education have been changed. They are presented in the paper. Graphic presentation of educational system with particular stress on agricultural schools has been presented in the paper. The educational reform requires the necessity of changing the system preparing teachers for different types of schools. Some part of the paper deals with this problem.

In Poland education starts when 6-year old children take part in one year lessons so called "pre-school education." The aim of these lessons is to equal the level of knowledge between the children who attended kindergartens and the ones who stayed at home.

Children at the age between 3 years and 6 years are supposed to spend their time at kindergartens. The number of places for children is limited. The fee for a kindergarten is very high and many parents cannot afford it. Parents are not always able to take care of their childrens intelectual development. They have fewer problems with looking after a child`s physical and emotional development. An obligatory participation in pre-school education was due to deficiency in intelectual bringing up children at their homes.

At the age of 7 children begin learning at primary school and they attend it for 8 years. Primary school is obligatory and it comprises the children up to the age of 16. Education in Poland is free i.e. parents do not pay for their children`s learning at school. Parents buy books /very expensive/ and a set of basic school equipment;

in case of choosing secondary school situated far from home, parents must cover a very expensive accomodation or dormitory.

After graduating from primary school pupils may further continue their education /Fig. 1/ depending on their interests, school grades and partly on their parents' financial status.

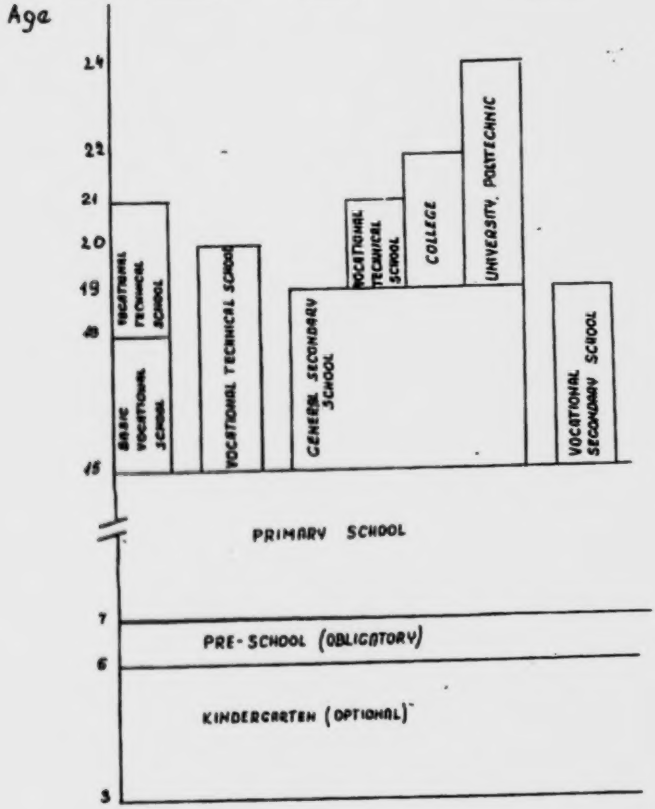
Age
24
22
21
20
19
18
15
7
6
3
VOCATIONAL TECHNICAL SCHOOL
BASIC VOCATIONAL SCHOOL
VOCATIONAL TECHNICAL SCHOOL
GENERAL SECONDARY SCHOOL
VOCATIONAL TECHNICAL SCHOOL
COLLEGE
UNIVERSITY, POLITECHNIC
VOCATIONAL SECONDARY SCHOOL
PRIMARY SCHOOL
PRE-SCHOOL (OBLIGATORY)
KINDERGARTEN (OPTIONAL)

FIG. 1 THE POLISH EDUCATIONAL SYSTEM

Very clever pupils having good grades at primary school usually take up learning at 4-year general secondary school or at 5-year technical secondary school with different directions. Pupils with lower grades on primary school certificates usually decide to contunue learning at basic vocational school /3 years/ or vocational secondary school /4 years/. Pupils who developed their interests and got good grades at basic vocational school may continue their learning at 3-year technical school. Graduates from general secondary school have got a very wide range of theoretical knowledge but none professional preparation. If they want to take up a job after graduating they should complete a chosen vocational course or continue their learning at post-secondary vocational technical school. Majority of general secondary school graduates who passed the final egzaminations at their school decide for further education at 3-year college or 5-year university studies. Technical school graduates usually take up a job but they also may study at polytechnics or at technical faculties at universities.

In 1989/1990 totally 1 755 365 pupils learnt in 9 366 secondary, half-secondary and post-secondary schools but the majority - 1 051 311 pupils learnt at technical schools. Taking into consideration the number of pupils economical schools took the second place, whereas agricultural ones took the third place /Tab. 1/. Girls dominated most of schools /except technical ones/: from 52.3% school girls in agricultural and forestry schools up to 95.2% girls in pupils structure in medical schools /Tab. 1, Fig. 2/.

The structure of pupils is differentiated in various types of schools. In 1989/1990 girls constituted 50.0% of secondary school pupils, 76.3% of post-secondary school pupils and 51.3% of higher school students and only 37.9% of pupils at half-secondary schools /Fig. 3/. Educational ambitions of girls are generally higher then boys. They also get better grades at entrance egzaminations for se-

TABLE 1.

PUPILS AND GRADUATES OF VOCATIONAL SCHOOLS ACCORDING TO GROUPS OF DIRECTIONS OF EDUCATION

GROUPS OF DIRECTIONS OF EDUCATION	PUPILS		GRADNATES	
	TOTAL	WOMEN	TOTAL	WOMEN
TOTAL	1755355	803123	435476	202222
AMONG THEM:				
TECHNICAL	1051311	257573	260421	67939
AGRICUTURAL AND FORESTRY	154933	81109	39453	20013
ECONOMICAL	314984	281082	82170	71643
MEDICAL	85798	81678	21168	19937
ARTISTIC	65085	38985	7619	4556

The source: Rocznik statystyczny 1991, Gus Warszawa

condary schools and universities. Majority of boys tend to become independent very quickly and take up a job. Girls also dominate in the structure of students of most higher schools /Tab. 2/, first of all at universities /76.8%/, higher pedagogical schools /73.7%/, medical academies /62.1%/ and economical academies /55.1%/.

Changes in vocational education with particular attention to agricultural education

As it has already been mentioned above general and obligatory primary school is a base of vocational education in Poland. The following types and levels of agricultural

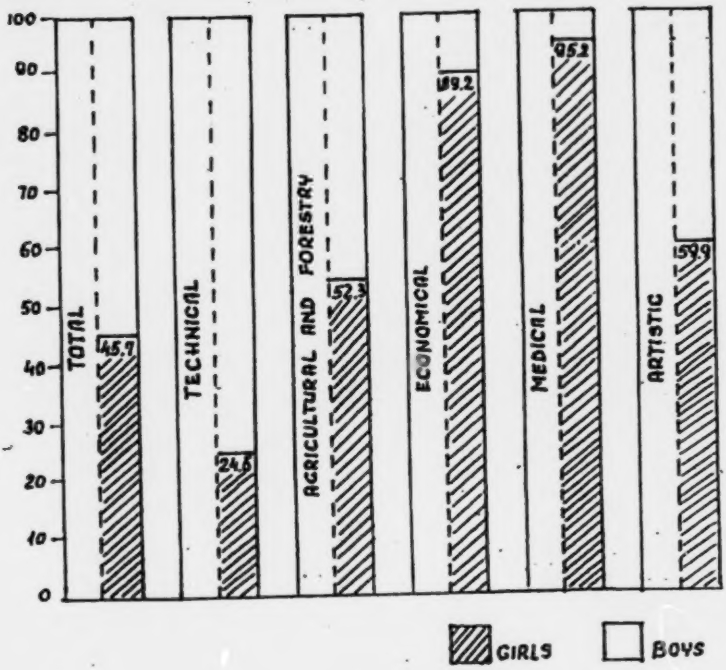

FIG. 2 THE STRUCTURE OF VOCATIONAL SCHOOL'S PUPILS ACCORDING TO DIRECTIONS OF EDUCATION IN 1989/1990

The source: Rocznik statystyczny 1991, GUS Warszawa, own calculations

education are based on this principle:

1. courses of agricultural training - elementary level for people without any other education than primary one and even with uncompleted primary school /or with no-agricultural education/;
2. basic agricultural schools - 3-year vocational schools preparing for all jobs in agriculture as well as for processing and service for a village;
3. agricultural technical schools - secondary vocational schools based on 8-year primary school /then 5-year/

Table 2

Students in different types of higher schools in 1989/90

Higher schools	Students		
	Total /in thousand/	Women	
		in thousand	%
Total	378.4	194.0	51.3
Universities	133.0	85.3	76.8
Polytechnics	72.0	11.8	16.4
Agricultural Universities	35.9	14.8	41.2
Economical Universities	23.6	13.0	55.1
Pedagogical Universities	46.1	34.0	73.7
Medical Academies	37.5	23.3	62.1
Higher Mariner Schools	2.4	0.1	4.2
Academies of Physical Education	14.1	5.2	36.9
Higher Artistic Schools	8.0	4.3	53.7
Theological Universities	5.8	2.2	37.9

The source: Rocznik statystyczny 1991, GUS Warszawa, own calculations

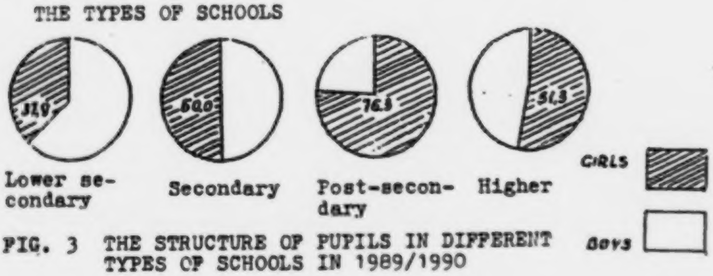

FIG. 3 THE STRUCTURE OF PUPILS IN DIFFERENT TYPES OF SCHOOLS IN 1989/1990

or based on vocational agricultural school /then 3-year/; they qualify pupils for taking up studies or a job for a post of a supervision of big state farms and cooperatives; they also give knowledge necessary for managing own farm. The schools educate in all agricultural professions, in agricultural processing and service for a village and agricultural maintenance;

3a. agricultural secondary schools and secondary vocational schools - intermediate forms between agricultural technical schools and general secondary schools with natural profile. Agricultural secondary school learning lasts for 4 years;

4. post-secondary agricultural technical schools - 2-year schools for graduates from general secondary schools - they give the same vocational preparation as technical schools;

5. higher agricultural studies /engineering or engineering -mastering/ educating in plant and /separately/ animal production and specialists in agricultural processing, agricultural mechanization, agricultural building, environmental protection, forestry, fishery and veterinary /KWIECIŃSKI 1991/.

Agricultural schools of all levels as well as other vocational education are in recession. It is the crisis of the function of education, rigid contents and forms of education; it is the inadequacy towards economical surrounding; it is the poverty of technical and didactic means at schools and universities. Hitherto state policy prefered urbanization and industralization of Poland at the cost of agriculture and country development. Young people "open" for innovation, looking for knowledge, the most valuable ones very often left villages and decided to stay in a town for ever. Agricultural staff is prepared for work in large state farms and productive cooperatives. Vocational schools offer very narrow vocational preparation and very shallow general education. Narrow vocational preparation is also given by technical schools and therefore they do not educate a highly qualified and independent farmer as well as a candidate for a iniversity. Higher schools also "produce" graduates with very narrow specialization and they do not meet the market needs and the requirements of modern economy and its widely meant management.

Deep political, social and economical changes which have taken place in Poland lately, slow but systematic changes in property /privatization and reprivatization/ have caused the necessity of carrying out principle changes in education and first of all in the program of education. Agricultural education as a part of education system in Poland is also responsible for general education. The deepest changes take place in general education in all types of schools. Instead of detailed programs of particular subjects so called "minimum programs" are introduced. It causes the change of a teacher`s attitude to school knowledge because he becomes an author of the most part of the program of "his" subject. The teacher`s responsibility for the level of knowledge of pupils increases. He must include the above mentioned changes taking place in our country in the teaching program. Agricultural schools should change the profile of education and they must prepare modern farmers instead of workers for state and cooperative agricultural plants. They are very deep qualitative changes in the goals of agricultural education.

A farmer - a graduate from agricultural school should be well prepared for organization and managing a farm, know modern productive techniques, principles of banking and trade, he should be open for innovations and know how to cooperate with other people, he should be aware of ecology and draw conclusions for his life and production, he should also be very resourceful and understanding his farmer, rural and regional identity /KWIECIŃSKI 1991/. In many agricultural schools we may observe different initiatives aiming at revival of education, introduction of ecological education, changes of productive training organization by carrying it out on family farms, adjustment of educational program to regional needs, rebuilding of cultural identity of rural youth, looking for contacts with abroad, paying more attention to learning foreign languages.

The Center of Advisory and Education in Agriculture in Brwinów near Warsaw plays a very important role in modernization of agricultural education. The Center carries out examination of the state of agricultural education, prepares valuable educational equipment, works out and introduces new programs concerning agricultural training and organizes courses for instructors of rural household. The effect of the work of the Center is modernization of the contents of special education in rural household at agricultural schools towards its adaptation to changes taking place in farms. Rural household is an obligatory subject at agricultural vocational schools and at agricultural secondary schools. It is also an optional subject at vocational agricultural schools which specialize in: general agriculture, horticulture, animal production and at vocational horticultural schools and economical secondary schools which specialize in: economics and accountancy of agricultural enterprises. As it has already been mentioned above girls dominate at these types of schools. It is necessary to change the profile of education in rural household in order to increase the number of hours in the following subjects: family nutrition, clothes economy, taking care and bringing up children, economics and organization of free time. It is due to the fact that in the structure of rural women work, duties devoted to family and keeping the house start to dominate other duties.

The Ministry of National Education and other ministries responsible for their vocational schools pay much attention to them and new tasks of different types of vocational schools which exist in changing conditions. Modernization of tasks is also necessary because of informatics revolution.

Higher education, including agricultural one, should also cope with scientific-technical changes especially in the field of biotechnology and agroecology development. We can still observe the lack of program elasticity, organization and methodology as well as separation of studies from the needs of work market. Agricultural universities as well as vocational secondary schools educate very narrow-minded specialists who do not have a full recognition in the problems concerning agricultural economy. The graduates from agricultural faculties get one-sided agrotechnical education and they are not prepared for managing a farm in conditions of market economy. They have not got sufficient knowledge about market especially concerning marketing attitude towards the productive program on a farm. The graduates from animal husbandry faculties are not well prepared in agrotechnique, agricultural mechanization, economics and enterprise organization as a whole. Agricultural economists are not experienced in productive technique, marketing and agrobusiness.

Long lasting interference of state bureaucracy in the process of education caused consolidation of pedagogical uniformism in higher education. There has been uniformity of programs and contents of education and as a consequence of this there has been equalization of diplomas in spite of the level of teaching and the prestige of a university. As there was no market for graduates with high qualifications only the fact of having a diploma but not the level of knowledge and ability was of great importance. Agricultural universities as well as other higher schools have not got enough financial means for: scientific research, scientific literature, foreign contacts and even teachers`salary. Commercialization of publishing production leads to overcoming difficult barriers in publishing the results of scientific research in low-edition publishers. It is par-

ticularly annoying not to have an access to foreign scientific literature. Young people become less interested in studying it is not the way leading to self-realization, getting a job and social status. The graduates from higher schools have got a delayed start of living conditions and profession and their salary is often lower than wages of qualified workers. Young people are much less interested in scientific-didactic work and therefore we can observe the process of growing older of academic teachers.
The above mentioned problems show the trend of necessary changes in goals of higher education in Poland. Alternative education which will help the graduates from universities, including agricultural ones, to obtain preparation anabling taking up a job on many posts, which are characterized by similar requirements and similar technique and technology, is absolutely necessary. This preparation is to anable acquiring new qualifications in similar specializations, it is very important to maintain professional mobility of workers, caused by mechanisms of market economy. New qualitative goals of a higher school mean the enrichment of studies with technical, ecological and economical-organizational contents paying attention to modern practical solutions. A graduate should receive an economical preparation which is very important in conditions of market competition. Universities should create in students particular features of personality and required professional attitudes, including abilities for creative thinking and self-activity, initiative, resourcefulness and ecological responsibility. Agricultural, animal husbandry and economical-organizational advisory will become a very important.specialization in agricultural studies.

In future it is expected to introduce some changes at universities, including agricultural higher schools, namely the restriction of obligatory subjects for the benefit of alternative subjects within the system of module studies organized on the basis of so called credits. It will be in accordance with the idea of individualization and elasticity of education process.

Teachers in the face of new goals

The rate of changes in different fields of national economy in Poland, including agriculture, depends on the rate of changes in vocational education. The changes in education are conditioned by preparation teachers for proper performance of new goals. It concerns both future teachers as well as the staff already working at different types of school.

The most important tasks for teachers are as follows:

- taking care of continuous bringing up to date their own knowledge and their pupils
- being open for methodological innovations
- being open for professional innovations necessary for assimilation and application in future by graduates; it will enable the graduates to become more elastic in adoption for the market needs
- ability for creating initiative of pupils as a feature necessary in effective work in conditions of market competition
- creating manager and marketing abilities
- wide popularization of ecological problems and natural environment protection
- bringing up pupils for democratic society
- preparing pupils for active participation in changing and improvement of political system
- preparing young generations for conscious living in united Europe.

Education of teachers take place on different levels and at different time depending on the type of school where future teachers will take up a job.

Teachers of professional subjects are educated at different faculties at polytechnics, agricultural universities, medical academies, artistic academies and at economical academies. The future teachers get there essential knowle-

dge but they usually get the pedagogical education at the Interfaculty Pedagogical Institute /e.g. at Poznań Polytechnic/, at the Institute of Agricultural Pedagogy /e.g. Main School of Farming in Warsaw/ or at the Institute of Agricultural Education /e.g. at the University of Agriculture and Technology in Olsztyn/. The Institute of Agricultural Pedagogy at the Main School of Farming in Warsaw and the Institute of Agricultural Education in Olsztyn prepare teachers for professional subjects for vocational and technical agricultural schools, at the Supplementary Master Studies. They are 2-year extra-mural studies for engineers writing master thesis on agricultural pedagogy. It is a form of bringing up qualifications of teachers being already employed at vocational and technical schools.
Academic teachers get pedagogical qualifications on didactic at higher school at the Study of Pedagogical Improvement. It concerns assistants who after graduating from the university take up a scientific and didactic work.
At present there are not any significant changes concerning the forms of teachers' education. Much stress is put on methodological preparation of teachers for their new goals mentioned above.
Professional education in Poland must break many barriers which come out from new aspects of economics, free working market, diploma competition /in future/. It can be done on the way of transformational processes but not revolutionary ones.

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I REFLECTIONS ON GASAT WORK IN THE FIELD OF EDUCATION AND SCHOOLING

6 Encouraging women to professional education and career development

CHANGING IMAGES:
WOMEN'S INSTITUTES AND SCIENCE

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Abstract:

Women's Institutes and science both have image problems. Women's Institutes (WIs) have for years provided a focus for rural women in Britain. Meetings and Markets are organised for discussions and the selling of produce. WIs have been treated rather dismissively by other sections of the population and labelled 'Jam and Jerusalem'. The National Federation of Women's Institutes supports a residential centre at which courses, usually in creative crafts, are offered to members. To date, few science-related courses have been included.

The image of science as esoteric, remote from everyday life, and pursued only by specialists is seen by the science establishment as legitimizing governmental under-funding. Hence, learned science societies have set up a 'Committee On the Public Understanding of Science' (COPUS) to change the image of science.

Collaboration between COPUS and the Women's Institutes has resulted in an initiative in which County WI representatives participated in a 'seeding' course at the WI College with the intention of dispersing science-related activities into the programmes of the local WIs. Course participants were also offered the opportunity to use their experiences to gain credits within the new National Vocational Qualifications.

Sixty women participated in the course and more than half submitted a report for an initial qualification.

This paper describes the development and content of the course, and evaluates the first stage of the project.

INTRODUCTION

Women's Institutes have been part of the scene in rural England and Wales since 1915. There are currently some 290,000 members, belonging to around 9000 local Institutes, which are organized into 70 County Federations. In addition, 550 Women's Institutes' Markets are held in local centres and are separately funded and organized.

Women's Institutes have been regarded, by non-members, with dismissive tolerance. They have been labelled with 'Jam and Jerusalem', descriptors arising from home- made jams sold in the Markets and the traditional singing of Jerusalem (Blake's social reform poem set to the stirring music of Parry) at the Annual General Meeting of the National Federation of Women's Institutes.

Since 1948 the National Federation has supported a residential study centre, Denman College, in rural Oxfordshire. More than 5,500 members attend residential courses each year. That the interest of members extends beyond 'Jam and Jerusalem' is shown by an analysis of courses run in the 1991/2 session: Art, Antiques and Photography (39), Craft-General (29), Craft-Textiles (30), Food and Wine (22), Language, Literature and Writing (9), Music Drama and Theatre (16), Social Studies (30), Sport, Dance, Health and Fitness (34) and General Education, Science and Technology (29). In the last category, 17 courses related to aspects of business, including the use of computers, but only three had specific science content. The Principal and Management Committee were anxious to extend the coverage of courses to include more science.

But science has an image problem too. It is seen as difficult and esoteric, to be pursued only by the specialist, usually male. The term 'boffin' characterises the public image of the scientist. The 'ordinary' citizen, especially if she is female, experiences a sense of distance and alienation from science.

The science establishment has expressed concern, for a number of years, over the under-funding of science by the government. This, they see, is legitimized by the lack of public understanding of, and support for, science. Consequently, a 'Committee On the Public Understanding of Science' (COPUS) was set up by the learned societies: the Royal Society, the British Association for the Advancement of Science, and the Royal Institution of Great Britain. COPUS makes small grants available to persons and institutions taking initiatives to improve the public understanding of science. The Royal Society's Education Officer, Dr Jill Nelson, assumed responsibility for coordinating the work of COPUS.

Recognising the alienation of women from science, Dr Nelson approached a number of women's organizations, such as the Girl Guides Association, and was invited to present the COPUS case to the Women's Advisory Group of yet another learned society: the Royal Society of Arts, Manufactures and Commerce (RSA). The chair of the Women's Institutes' Education and Training Committee, a member of this group, immediately recognised that fruitful collaboration was possible. Collaboration led to the conception of an image-changing process, the first stage of which is described and evaluated in this paper.

DEVELOPMENT OF AN IDEA

With COPUS providing financial support, a small planning group was assembled, comprising science educators (all with experience in equal opportunities work), and representatives from COPUS, the WI and Denman College Staff.

The following plan emerged from discussion: a 'seeding' course, over 4 days, would be held at the College. This would not be on open offer, but County Federations would be invited to put forward the names and profiles of three representatives, one of whom would be chosen by the college. The criteria for proposal and selection were identified as: an openness to science, a commitment to organise science-related activities in their County Federation Area following the course, and organisational skills.

The objectives of the course were as follows: -to demonstrate science as a human activity, relevant to people's everyday lives;

-to provide an enjoyable experience for participants so that they would feel good about science;

-to introduce the kinds of resources available within the community for science-based activities and to key participants into existing support systems.

These objectives were set within the wider objectives of the whole initiative which were:

-to change the image of science as difficult and remote.

-to empower women by developing their confidence in relation to science.

As the initiative was developed within the Women's Institute Federations, if successful, it would extend the image of Women's Institutes.

Along the planning process a representative of the London Open Colleges Federation (LOCF) became involved. The time commitment of a four day course would qualify it for accreditation at Level 3 (a level equivalent to the school leaving qualification) within National Vocational Qualifications 3. The organisation and evaluation of follow-up activities with other WI members in their County Federations would qualify for a Level 4 qualification, which is at Higher Education access level

The advantage of this development would be the further empowerment of the course participants themselves: the disadvantage would be the danger of killing enjoyment of the course by some kind of terminal test. This was resolved by the decision to offer the opportunity to qualify by the submission of reports, if the participant wished to do so.

The author eventually assumed the chair of the planning group, the coordination of the science units, the tutoring of one of the units, the presentation of the course for accreditation and the assessment of participants' reports.

COMMUNICATION

The usual channels of communication of the WI were used: information was sent to County Federation Secretaries for discussion by County Executive Committees; it was included in the newsletter which is sent regularly to all county officers; the course was featured twice in 'Home and Country' (the WI journal available to all members on subscription), and it was included in the Denman College Course information handbook made available to each local Women's Institute.

RESPONSE

The response across the country was very uneven. Although participation in the course was at no cost to the WI member, some County Federations were unable to put forward the name of even one member, while another had 70 members prepared to participate. In the event, 60 women attended the course, representing 52 County Federations.

THE COURSE

The response was entitled 'Science, You and Everyday Life'.

It contained a number of components:

- ice-breakers: a science trail around the grounds;

- hands-on soap bubble extravaganza on the lawn;
- build a giant snowflake (in the bar, after dinner, using a kit)

- a first evening science theatre production;

- an evening meal at the University Department of continuing education in Oxford, followed by a visit to either an history of science museum or a hands-on science centre: -four half-day science sessions;

- thinking and planning ahead in regional groups

In the science sessions four themes were presented by four tutors, all experienced adult educators:

-In Tune with Vibrations - investigating sound, resonance, electromagnetic vibrations, musical tones and instruments;

-Colourful Consequences - producing and observing colours; the importance of the observer, the light falling on the surface and the dyes used to colour the surface;

-Genes and Gender - an enquiry into genes, chromosomes, sex, inheritance, genetic diseases and risk;

-Wash 'n' Wear - which investigated the properties of water, detergents and natural and synthetic fibres, attempting to link chemical structure to behaviour.

The units were run four times and participants, in four groups, spent half a day (21/2 hours) with each tutor. The intention with each unit was to start with everyday experiences familiar especially to women, to provide hands-on investigations which posed, if possible, a puzzle and to extend to 'big science' and social issues. A tall order in 21/2 hours!

FEEDBACK, EVALUATION AND DISCUSSION

Recruitment

The lack of response in some areas may reflect the problem addressed by the course - neither the County Federation Officers nor individual members felt sufficient interest in science to make a move towards identifying delegates.

Comments from participants confirmed that in some County Federations communication about the course did not reach ordinary members. The Executive Committee may have approached individuals who were thought to fit the criteria. In others, a local newsletter was used to invite members to apply for the course. If more than three responded, a ballot selected the required number to go forward to the college.

Enjoyment

Throughout the four days participants showed warm positive responses to activities. One woman commented, to smiling agreement from others, 'If science had been like this when we were at school we would all have been scientists!' It seemed that the experience had been enjoyable for them. This was confirmed without exception in responses on the college evaluation sheets and in submitted reports. Many mentioned the science trail as an excellent introduction to the course. The most popular units were 'vibrations' and 'colour'. The omission of chemistry explanations was the only change recommended by some of the participants, but for another the 'Wash 'n Wear' unit finally convinced her that she should work for an Open University degree.

Learning

Just over two thirds of the participants (41) submitted a report for a LOCF qualification. The following quotations give a flavour of what they said-

> 'Let's explore music', although aimed at 8-11 year olds, hit the right note for me (I thought I hated physics!) without being condescending.
>
> I discovered that each topic covered clarified some foggy 'basics' from my schooldays. I can remember struggling in Biology with cell division and chromosomes but the help of a few felt strips and velcro made daylight dawn.
>
> We saw pink elephants and know why! We saw rainbows through prisms, through water, on mirrors and heard how they form.

(We) were delighted to discover the musical potential of empty bottles (wine bottles sound the best!) and drinking straws ...... the true fascination lay not in the strange observations but in their scientific explanation. Take, for example, the pink elephant, seen floating around the room by 15 ladies who thought they were sober (in spite of the empty bottles of the morning session). It was discovered that he appeared courtesy of his friend, the green elephant, that everyone had been staring hard at for some time. All the little green cells in the eye had become tired, leaving only red and blue detectors working and the brain saw pink elephant instead of white wall.

I learned a great deal about the structure of water and how detergents work and the molecular structure of natural and synthetic fibres - me, who until then would have thought a periodic table was something to do with the Antiques Roadshow! ..... I came, I learned and I wish to learn more.

I comprehended far more than I dared to have hoped and marvelled at the instructional technique which made it possible. Of course, the displays and demonstrations were well thought out and the tutors especially lucid and skilled; but for me it was how our own participation was developed which made such a success of the journey of discovery.

The Floating Point Theatre was a new experience and I hope to encourage my Federation to challenge our members to write and produce a play/tableau with a science theme; we could include local schools as well.

I was so elated, that returning home via Oxford railway station and its shop, I ostentatiously bought a copy of 'New Scientist'!

On a personal level this course has given me the 'kick' I needed to start getting on with the rest of my life. I am now making enquiries into the possibility of doing an access course ..... with a view to doing a BEd.

I noticed and discussed with them the reactions of others on the course to the different sections. These observations should be useful in planning.

The gathering had a more positive attitude towards (science) .... than an average WI meeting would. Therefore I agree that a subtle approach is called for at home.

The Task Ahead

The comments above reveal that the course had personal significance for some of the women: they were committing themselves to further learning. But they were also very serious about spreading their enjoyment of science, however recent, to other members of the WI.

They appreciated the importance of motivation in the readiness to be involved with science activities. Their own motivations had been revealed when some reported being intrigued by a new kind of course. This could arise from an earlier science base, now rusty, or from an acknowledged lack of one. Others felt honoured by being selected and wanted to justify this. Many displayed a deep commitment to their County Federation.

Attempts elsewhere to develop confidence in science with women has built on a professional base and over a longer period of time than the four days of this course. Israelsson and Nordell (1990) reported on three workshops with pre-school teachers, in Sweden, which also used everyday household equipment and experiences as starting points. The teachers were encouraged to investigate and experiment and were helped after each session to provide similar experiences with pre-school children. It was found that few had become confident enough to develop new work on their own. A more extended programme was recommended.

Bearlin (1991) and Kirkwood worked with Primary and Early Childhood teachers, in Australia, in a year-long programme which was reported to be particularly successful in empowering women, both professionally and personally. It used a 'connected teaching' approach which 'brings together thinking and feeling, public and private (subjective) knowledge, public and domestic technologies' in a gender sensitive context.

It was stressed to the WI course members that they were not expected, themselves, to reproduce the investigations offered on the course (although some of them felt able to use bottles and straws for musical sounds, and soap bubbles and experiments with detergents, with their Institutes). Each member of the course was given a directory indexed by postcode, "Science and Technology on Your Doorstep", which gave names and addresses of persons, and their institutions, throughout the country, who had expressed a readiness to offer help with science activities.

A number of potential problems face even the most committed course member in carrying out the task of breaking down the alienation from science felt by many WI members:

-they may face a lack of sympathy from County Executive Officers (one woman has already been told by her County Chair that the programme is full for the coming year);

-they can rely on no professional or even cultural pressure (as with teacher in-service programmes) to motivate members to be involved with science activities;

-the local 'specialists' may have little experience of, or expertise in, working with mature women.

Course participants themselves agreed they must not use the word 'science' in publicity materials, that activities need to be linked with current interests of members, or to be spectacular and fun. It will be interesting to read their reports of the year ahead.

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ESTONIAN BUSINESSWOMAN '92 - SKETCH OF A PORTRAIT

Anne Randmer
Viive Krips

Estonian Management Institute

A new type of an entrepreneur is entering Estonian business life: an independent woman that for many reasons wants to realize herself outside her home. A new client on the training market created the supply. Estonian Management Institute was the first to start courses designed specially for businesswomen. As beginners we took over training programs that were already used successfully in other countries. However, it soon became apparent that not all of them were relevant or useful for our businesswomen. So it was necessary for us to find out what our client - the Estonian businesswoman - is like, what is her background, her earlier experience etc. The article is based on our findings from interviewing and testing course participants.

The breakthrough in entrepreneurship in Estonia occurred in late 1980s when private initiative became legal. As at least half of the population in any country is female it is only natural that representatives of the fair sex made their entrance into the business scene.

The emergence of a new type of an entrepreneur created the need for a new type of training, aimed to assist female entrepreneurs in establishing their own businesses. Perceiving a gap in the training market the Estonian Management Institute started to gradually fill it. Our approach was dictated by research findings and statistical data which clearly indicated the imminent threat of unemployment for women more than for men, as one of the characteristic features of Estonian labour market is a remarkably great proportion of well-educated women in the social sphere and administrative posts.

189 women participated in our courses in 1991/92. Parallel to our training we started to investigate the needs of our clients. Already the first follow-up questionnaire of the first course in spring 1991 showed that our businesswomen were extremely critical about the programs copied almost without changes from the people from Small Business Development Department in the National Industrial Board of Sweden (Lagerström, 1991). Based on extensive research that show high correlation between certain personal characteristics and success (Pickle, Abramson, 1990) we came up with the following model:

Drive.....................:
Intellectual ability......:
Communicative ability.....: ------\
Technical skills..........: ------/ Success of a business person
Ability to make decisions.:
Conceptual ability........:

Knowing one's own strengths and weaknesses is one of the key-points in making a good business plan and starting a successful business according to the classic scheme. Therefore we chose to use a self-assessment questionnaire in the first stage of our research of Estonian businesswomen. The self-assessment questionnaire is also a cognitive model that includes one possible basis for evaluating success; at the same time, a self-assessment in conformity with reality is a precondition for a successful career planning (Ivancevitch, Glueck, 1986).

Our research included 147 businesswomen (out of 189) who participated in special courses for them in Estonian Management Institute and who returned filled questionnaires. The surveyed group is divided into age groups as shown in table 1 (level of education is given as well):

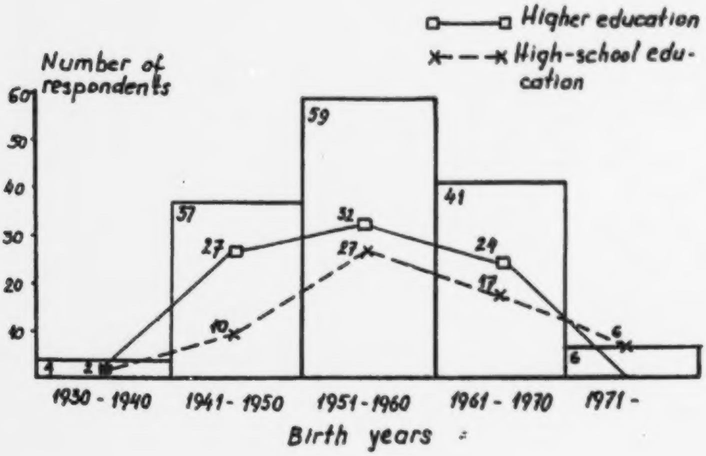

Table 1: The division into age groups and education level of Estonian businesswomen

The average age for an Estonian businesswoman is 37 years, she most often has a business or technical university diploma (Tallinn Technical University, 54.4% of participants).

We were also interested in their family background: an overwhelming majority were a first or only child (78.6%), came from bigger towns (Tallinn, Tartu, Pärnu) and their parents were white-collar workers (69.9%). Only 23.8% of respondents had earlier experience in business or management.

Our test included 3 groups of questions:
- abilities;
- values;
- willingness to work with people;

Here are some initial results of our research:

1. Abilities

1.1. Verbal ability

Estonian businesswoman thinks she communicates rather well in normal (peaceful) situations and she can convince her partners in what she thinks is right. In negotiations she usually reaches an agreement or can at least bring different parties closer to an agreement. In extreme situations she often loses her head and is sorry for that later on.

1.2. Social abilities

Our businesswoman communicates naturally and freely in social situations. Contacts with people who turn to her for information or service are easy.

Estonian businesswomen's ability to tolerate criticism of herself or her companies is rather low in their own opinion.

1.3. Numeral-logistic abilities

As most of Estonian businesswomen have higher business-technical education it is no wonder they consider themselves competent enough to handle quantitative data; they can gather, process and present it. They are also rather convinced they can use their analytical mind to analyse and solve problems that arise in the work of the company. We think that this aspect of our women's self-assessment should be further researched as practice shows that companies of Estonian women are usually (almost 98%) small both by turnover and number of employees, but at the same time they buy bookkeeping services, finding it too difficult to do by themselves.

1.4. Creative abilities

Estonian women do not estimate their ability to create new ideas and programs to be very high: they tend to turn rather to traditional fields like service, small retail trade, handicrafts, and frequently combine work with a hobby (e.g. selling self-made items). At the same time our women are quite convinced that they can mix known elements in a new way should that become necessary or possible.

1.5. Managerial abilities

Estonian women do not think too highly of their knowledge of organizational planning and managing a company. Therefore it is no wonder that their companies are small (as mentioned earlier) and have a simple structure (mostly one-woman firm or family company). When the company starts to grow - and they lose personal control - women order organizational programs and projects from prominent consultants, who more often than not are men (and whom they trust more than female consultants!). At the same time Estonian women consider their ability to make decisions sufficient, and readiness to carry out and answer for made decisions even very high (frequently it becomes a burden).

2. Values

The Estonian businesswoman values her independence very highly - that is, the possibility to determine herself the content and character of her work. It is also extremely important for her to have a secure job, and to receive deserved and visible recognition for her work (both financial and moral, but financial is more important). The support of people close to her (usually a husband, but also friends) is important for a businesswoman ("Will I succeed? What will others think of me if my business fails?"

are questions that in too many cases have stopped women from carrying out their ideas in practice: 1/3 of our course participants have registered their company but are not active in business). Almost 84% of respondents said that the main reason for starting their own business - besides the threat of unemployment - was their unwillingness to take orders from others. Women also want to have more flexibility in planning their working hours: 60% of women have given up fixed-hour jobs of a civil servant. But a really high priority for our women is their time outside their work. Therefore they want their courses to include vitally important matters and hate it when there is only "water" there; i.e. a course is not merely a place for new contacts (as it is often for men) but it has to help them in practical matters the next day already.

3. Willingness to Work with People

It is important for women to feel support for their ideas and activities. But as they are usually just beginners in business their contacts are not very widespread. However, with existing contacts they plan long-term cooperation. Our businesswomen are generally dispassionate about "club" activities (housework and family demand the time left over from office). The fact that a number of course- participants checked "hope to make new contacts for developing my business activities" as one (but not the most important) reasons for coming is also an indicator of their great dissatisfaction with such possibilities otherwise.

* * * * *

Summary:

1. An Estonian businesswoman is, as a rule, more calculating, weighs her prospects carefully, attaches great significance to others' opinions (Will I ever be successful? What if I fail?).
There are a few highly successful ladies in Estonia that have made a glorious start in every respect (volume of turnover, number of employees and share of the market). However, these are extremely rare cases.

2. An Estonian female entrepreneur enters the business field at a relatively mature age (those starting in their forties are not infrequent/uncommon).

3. An Estonian businesswoman is more down-to-earth and realistic in evaluating business ideas than her male colleague.

As the study of Estonian businesswomen is only in its beginning we think that there are to be many interesting finds in the future.

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Positive action to encourage women returners to follow higher education courses in computing: A case study

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This paper considers the reasons behind the fact that there is a relatively small number of women entering higher education courses in Computing. It goes on to describe recent experience of positive action to remedy this situation. This action involves three day introductory courses, six week courses coupled with extra counselling when the students enter the Higher National Diploma Course. The feedback from the participants on these courses is discussed and also their progress up to the present time.

Introduction

Figures for admissions to Polytechnics in England and Wales show that the percentage of women admitted to Computer Studies degree courses has risen slightly in the last three years to a figure of 22% in 1991. [1] Figures produced by UCCA for University admissions to Computer Studies degree courses show that the percentage of women entering these degree courses has shown a similar small increase over the last four years (1987/88 11% of the admissions were women, 1988/89 12.6% were women and in 1990/91 13.6% were women)[2]

Statistics for admissions in 1990/91 for all courses (both degree and HND, full and part-time) at the University of Wolverhampton show that overall the University has an even distribution of female and male students. However in the School of Computing only 12% of all full time admissions were female with only 10% of students being over 30 years of age. [3]

As a result of these statistics, the School of Computing at the University of Wolverhampton set up a "Women Into Computing" section. The aim of the section is to encourage both school girls and women returners to look positively at careers and courses in Computing. Several three day courses have been held for both mature women returners and school girls to provide an introduction to different aspects of computing and provide general careers information. [4]

It was decided however, to take this policy one step further and provide a well defined path for women returners which would eventually culminate in them obtaining an H.N.D in Computing. It would then be possible for them to transfer to the third year of the degree course if they wished to gain further academic qualifications. In fact this policy was part of an overall University of Wolverhampton policy to increase the number of students entering courses from certain categories in the community. The University's mission statement declares "The University is dedicated to the extension of access, to becoming an even more open institution and in aiding the movement towards a 30% participation rate for Higher Education in Britain on as short a time scale as possible".

Problems to be Addressed

The main problems in increasing the number of Women returners who successfully enter and complete HND Computing Courses are;-

i) Lack of confidence on the part of women returners regarding their ability to be successful in the field of Computing. [4]

ii) Lack of formal qualifications i.e. 'O' levels and 'A' levels.

iii) Lack of confidence on the part of women returners regarding their ability to study at an academic level alongside 18 year olds. In fact most 18 year olds have come through an education system which has now become much more computer orientated. Information Technology forms part of most subject syllabuses in the National Curriculum and school children accept the use of computers. This means in turn much of the technology associated with computers is familiar to 18 year olds and this exacerbates the lack of confidence on the part of women returners.

iv) Family commitments, young children, children at school and the associated guilt and lack of support provided by the family[6]

v) Lack of knowledge of how to go about obtaining information about entry onto Higher Education courses.

vi) Sudden changes in circumstance ie family illness, family moves, divorce etc.

Responses to these problems at the University of Wolverhampton

The 'Women into Computing' section decided that the following plan would alleviate the problems described above or at least go some way to doing so. Three day introductory courses could still be used, but special care would be taken to identify those participants who wished to enter higher education and follow a computing course. Every June/July a six week course would be run after the full time University students had finished their studies to enable suitable candidates to complete two modules based on the HND in Computing. The two modules are;

Introduction to Information Technology

The aims of this module are that the student should;-

1) Understand the basic concepts of Computer Technology.
2) Be familiar with a range of Information Technology.
3) Be able to evaluate a range of computer hardware & software.
4) Develop skill in the use of a range of standard software packages.
5) Develop oral and written presentation techniques.

Development of Computer Study Skills

The aims of this module are that the student should;-

1) Develop confidence in handling, evaluating and communicating information, to lead to the production of portfolios and the preparation for interviews.
2) Develop an awareness of the role of data processing in supplying the information requirements of an organisation.
3) Appreciate the basic techniques used in handling and processing data and the roles of data processing personnel within an organisation.
4) Develop her knowledge-base in mathematics.
5) Develop transferable skills using mathematical techniques in the context of IT and business problems.

It was planned to select 20 women to attend each six week course with one or two lecturers supervising at any time. The course was to be timed so that the local school were not on holiday and creche facilities were available for younger children . The timing of the course was 10 am - 2.45 pm with lunch from 12 - 12.45. It was anticipated that funding might be obtained from the European Social Fund.

It was then envisaged that as part of the second module, the participants would write an extended C.V. which at the University of Wolverhampton is known as a portfolio. The aim of the portfolio is to allow applicants to document the relevant skills techniques and abilities which they have developed through their experience of life, work, pastimes and courses, thus allowing an assessment of prior learning.

When the portfolio is assessed the admissions tutor looks for;-

a) Evidence of the ability to learn by various means eg books, manuals, informal discussions, presentations etc.
b) The application of learning to solving different problems.
c) The ability to communicate by written work ie reports, essays, manuals, minutes/agenda.
d) The ability to be self-critical and draw conclusions.
e) The ability to cope with symbolic abstraction.
f) The development of self management eg planning, meeting deadlines and coping with change.

The admissions tutor also interviews candidates who have prepared a portfolio when further assessment of suitability for the HND course is made. The final element of the plan was that extra guidance was to be given to the students who entered the HND via the 'Women into Computing' path. This was to involve careful consideration of timetables to fit in with family commitments and also extra counselling. The students were also to be carefully monitored by means of questionnaires and interviews to ascertain their problems and how they were progressing in general.

Consideration of the plan after the first year

Two three day introductory courses were held in September 1990 and December 1990. The first for 40 students and the second for 20 students. The fact that two courses were held was the direct result of overwhelming demand.

The longer six week introductory course was mentioned at both these courses and an advertisement for the six week course was also placed in the local free paper. Again the demand was overwhelming, over 100 people applied for places. Interviews were conducted and after much consideration 20 applicants were selected. The range of their previous academic experience varied considerably from a degree in an Arts subject to no formal qualifications at all. European social funding was at last forthcoming and covered 45% of the costs.

In the first week only one of the two modules was studied ('Introduction to Information Technology') as it was considered imperative to totally immerse the students in actual 'hands on' computer experience as soon as they started the course. Two very experienced lecturers were at hand at all times to help the students and provide encouragement. The module was not taught by lectures, there is a specially designed course booklet with student exercises. Assessments were carried out at regular intervals, some individual and some group assessments. There was no end-of-module examination.

The assessments were;-
Wordprocessing and MSDOS - individual assessment
Foxbase)
Supercalc) group assessments

The first few days were very traumatic for most of the participants. Many found it very difficult to think academically for such a long period-others found working on the keyboard difficult. These problems needed very careful handling on the part of the lecturers and the Course Leader, listening to worries, calming anxieties etc. By the end of the first week all the participants were more relaxed and most felt they could complete the course. One student was having trouble because English was not her native language and others felt that perhaps the academic content was higher than they were capable of achieving.

In the second week the two modules were studied side by side, one in the morning and one in the afternoon. The introduction to mathematics was taught by means of lectures and course booklets as was the data processing material. There were several assessments including an individual maths assessment and a group assessment for data processing. (This took the form of a presentation)

As the weeks passed, the students became much more confident although some still felt that perhaps they would not be able to finish the course. If assessments were not successfully completed then it was possible to retake that particular element at a later date in accordance with normal procedure on an HND course.

The skills and abilities of the students developed rapidly and by the fifth week it was clear that the majority of the students would successfully complete the course.

In the last week of the course attention was turned to portfolio writing and interview techniques. Most of the students had a good idea of where their future plans lay. Some were hoping to gain entry directly onto the HND, others felt that even though they had successfully completed the course they wanted another year in Further Education on an Access Course before coming into Higher Education. The final group hoped to go straight on to a job or to run their own or a family business.

After six weeks, 19 of the 20 students had successfully completed the course. The one student who dropped out had done so because of family illness.

Five students applied, with the aid of their portfolio, for the HND in Computing (full time) and two for the part time course. They were interviewed by the HND Course Leader and the Course Leader for the six week course and all given places.

The Course Leader of the HND made every effort to consider their individual needs (eg several were single parent families with school age children) in planning in which tutorial groups they should be placed. The part time students were also allowed to attend modules with the full time students rather than with students who had day release as this meant they had more hours of 'class contact'. The Course Leader for the HND (and her deputy) had taught on the six week course and so were very sympathetic to the needs of the students. The Course Leader for the six week course also agreed to help with any counselling that was necessary.

The participants on the six week course were asked to fill in a questionnaire at the end of the course and then after six months to ascertain the success of the course and how it could be modified if necessary. It was also intended to follow the progress of the participants in their jobs/courses etc.

Evaluation of the Course

As a result of the questionnaires completed at the end of the six week course, the formal qualifications of the students when they arrived was found to be as follows:

Highest Formal Qualification	Number of Students
Degree	1
'A' levels	5
'O' levels	4
Office qualifications (eg. R.S.A.)	7
No formal qualifications	2

When asked why they had wanted to attend the course twelve said they wanted to go on to full time or part time courses in higher education, six wanted to get a better job and one wanted to improve her knowledge in order to run a family business. Everyone indicated that they found the course interesting and relevant but five said it was very difficult to keep up with the work. They found the methods of assessment to be helpful in monitoring their progress and 60% said the assessments were at the correct level. Everyone found the staff helpful and supportive.

At this stage (ie the end of the six week course) five hoped to go on to the full time HND in computing, three hoped to go on to the part time HND, two wanted to go on to other courses in higher education, four wanted to go on to Access courses in further education and four hoped to get jobs. One was undecided. Perhaps the most pleasing aspect was that 16 felt that the University of Wolverhampton had made an excellent effort to attract women into their computer courses.

In December 1991/Jan 1992 questionnaires were again sent out, one questionnaire to the students who had gone on to the HND (five full time and two part time) and a different questionnaire to the other participants.

By December, one of the part time students had dropped out due to a family problem but all the rest were still on the course.

It is normal for HND students to study four modules each half year but as our students had already been accredited for "Introduction to Information Technology" they had only to study three modules. This was a distinct advantage as it meant that entry into full time higher education was cushioned slightly. The three modules they studied were "Introduction to Programming", "Mathematics for Computing" and "Organisation and Data Processing". They all reported that "Introduction to Programming" was causing the most problems. However most 'ordinary' students were also experiencing difficulty with this module. They all felt the lecturers had been especially sympathetic and one lecturer had put on extra classes in programming to help students who were experiencing difficulties. They felt that other students on the course were very sympathetic and helpful. One student wrote 'I am in a group of other mainly mature students and we are all very supportive for each other. If we ever get down days, the rest of us rally round. We all share similar problems ie balancing family, home and education. It isn't easy but it is fun' Most felt that they had gained considerably in confidence both from the six week course and the first term of the HND. One said 'I didn't know my own capabilities and felt I would always regret it if I didn't ever see how good I could be'.

At the end of the first semester all of the full time students passed the three modules they were studying.

70% of the participants on the six week course who did not go straight onto the HND returned the questionnaire sent to them after six months. The paths they had followed are shown following:

Course/Job	No of participants
Further Education (Access Courses)	3
Other Further Education Courses	1
Running own business	1
Assistant in a School	1
Catering assistant	1
Retail Management	1
Doctors assistant	1

Most felt that the six week course had been of great benefit to them. One of the women who has a job now said "It gave me the confidence to start another course (part-time). I am considered as somewhat of a computer genius where I work and this is because the course convinced me not to be afraid of the computer but to have a go".

Conclusion

A scheme has been established which will enable women returners to successfully complete an HND in Computing at the University of Wolverhampton. All the different elements of the scheme i.e. Three Day Introductory Course, Six Week Course and extra counselling help are now in place.

The scheme has been extended for 1992/93. University of Wolverhampton opened the 'Polytechnic in Shropshire' at Telford in 1990. The E.S.F. has provided funding for both the Three day course and the Six week course to be run at Telford as well as at Wolverhampton. The computer facilities at Telford are only compatible with 15 students at the moment although there are plans to expand. This means that 35 women (20 from Wolverhampton, 15 from Telford) will have the potential this year to start the H.N.D. course. Funding has also been received for a year long M.Sc Conversion Course in Computing for women returners who have a degree in a non-computing discipline.

The most important lesson that has been learnt from the whole scheme is the tremendous amount of confidence all the women have gained. One wrote "I would like to thank you very much for the confidence I have gained especially as I had been going through a rough time with personal matters. I feel more capable of approaching jobs I would never have dreamt of doing before".

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GENDER AND SCIENCE AND TECHNOLOGY

GASAT

October 25-29 1992

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Volume II

Ten years GASAT activities in a changing Europe

EAST AND WEST EUROPEAN CONFERENCE

SE 054 179

Ten years GASAT activities in a changing Europe

CONTRIBUTIONS

to the conference October 25-29 1992

VOLUME II

Compiled and introduced by

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PREFACE

Three years ago, during the second European GASAT Conference in Jönköping, a group of participants was thinking about ways to continue discussions between researchers, teachers and policy-makers on the issue of Gender, Science and Technology on European level. It was felt that a European exchange should not be hampered by the absence of colleagues from East European countries. A full understanding of interactions between Gender, Science and Technology, includes cultural and historical data; learning from international comparison is a prerequisite. More effort should be given to encourage involvement from East European colleagues in the next GASAT Conference. When the Eindhoven University Group took the initiative to organize the Third European GASAT Conference in 1992 one of its main objectives became to get together participants from East and West Europe.

With financial assistance of the Eindhoven University of Technology a planning committee was constituted. The committee has taken full responsibility for all aspects concerning the conference, assisted by a Dutch and an International Advisory Board as well. All groups have been working hard to realize the third European GASAT conference as a meeting of colleagues from East and West, where current initiatives in research and intervention programmes will be discussed and joint European projects challenged.

The planning committee is thankful for support from the Dutch Ministry of Education and Science and also from Dutch industry.

Of course the most important contribution is coming from the participants. We received 43 papers of which 12 by authors from East-European countries. They have been classified according to the main themes and sub-themes of the conference and are published in that order in two volumes. It is our sincere wish that this flying start is the prelude of a succesful conference!

On behalf of the planning committee,

Marijke van Vonderen
Marja Brand

INTRODUCTION

GASAT conferences bring together women and men who are concerned to encourage research and interventions into all aspects of gender differentiation in science and technology education and employment. Gender aspects in the field of natural sciences and technology is the main subject of this book that consists of two volumes, containing the formal papers that have been accepted for the Third European GASAT Conference on Gender Science and Technology 1992. Following the tradition of GASAT-conferences the Contributions are distributed in advance of the conference. This procedure has also been used at the first and second European GASAT conferences at Elsinor, Denmark in 1986 and Jönköping, Sweden in 1990.

Objectives of this third conference are to provide perspectives on joint European projects and to stimulate exchange of ideas and experiences in each European country with regard to current initiatives related to intervention and research in education, schooling and employment.

Participants in the European GASAT Conference '92 represent approximately 25 countries. The planning committee received 43 papers which are organized according to four main themes and an excursion:

1. Education and Schooling
   This theme includes papers which deal with the social context of learning, instruction and eduction, but also includes papers which focus on the choice of school subjects, access to technical educations and continuing adult education in the area of career development.
   For this theme 23 papers are submitted; they have been subdivided into 6 subthemes.
2. Employment
   This theme includes papers which deal with values with regard to employment in engineering and the combination of work and family. Also papers focusing on restrictions and strategies of professional career

development belong to this theme. Nine papers are submitted for this theme and they have been divided in three subthemes.

3. Research Methodology and Evaluation of Interventions
   This theme consists of two subthemes, the first includes three papers which focus on research methodology and the second subtheme consists of three papers discussing evaluations of interventions.
4. Joint European Projects
   Three papers either discuss existing European projects or challenge setting up those projects

Excursion: House of the Future
In preparation of a GASAT-excursion to the Dutch House of the Future, two papers have been written. At the Conference they will be discussed in one of the Workshops.

Within each sub-theme the papers are arranged alphabetically according to the first author's name. Some of the papers contribute to more than one sub-theme. In that case other criteria such as distribution of authors form East and West Europe and a maximum of four papers per sub-theme have been used for assignment to a theme.

The English of the papers received before due time have been corrected, if necessary. We are grateful to Jan Harding for her mediation.

The formal papers published in these two volumes precede other contributions to be expected at the conference: the keynote addresses, poster papers and theses for round table discussions. They are the basis for exchange of ideas and experiences in paper sessions, workshops and round table meetings. The planning committee is looking forward to meet all of you at the Eindhoven conference.

Organization and members

* * *

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WHY DO WE STILL HAVE SO FEW WOMEN ENGINEERS IN EUROPE AND THE USA?

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The last twenty years have seen an increase in the numbers of women working as engineers in Western Europe and the USA, but they remain a tiny proportion of the profession. This paper examines three particular issues which throw light on why the situation continues : the sexualized nature of the workplace, the absence of mentoring for women, and the possible conflict of male and female values. It argues for the need to continue with critical feminist work in these areas.

In the last 15 years there has been, in the UK, a dramatic increase in the numbers of women working as professional engineers, scientists and technologists. The UK Engineering Industry Training Board recorded 1,169 women in 1978 and 5,035 in 1990 ; an increase of 330.7% (Devine, 1991). This dramatic increase in real numbers disguises the fact that women are still only about 5% of all professional engineers in the UK. Demographic data from other developed countries presented at the 1991 International Conference of Women Engineers (ICWES) reported figures of between 2% (Australia and Switzerland) and 8% (France)(Hatfield, 1991). In general although most Western European countries are showing an increase in the numbers of women engineers, this increase is remarkably slow.

Within the UK engineering industry itself (see table 1), although 20.5% of employees are women, one third of these are clerks, office machine operators, secretaries and typists. Only 1.3% of women in the industry are professional engineers, scientists and technologists (5.2% of this occupational category) and a further 1.5% are technicians or draughts-persona (3.5% of the occupational category). The profession of engineer remains a traditionally male profession, despite ten years of campaigning by women, central government and the engineering industry and a dramatic restructuring of labour markets. In 1985 Cynthia Cockburn wrote:

> *"...with men objectively weakened in the labour market, employers indifferent to or even positive towards employing women, and women themselves showing a new confidence in*

> *their right to work,we might expect to see women entering technical training and skilled occupations in new technology in equal numbers with men. If... this is not happening, it should alert us to ask more penetrating questions about how male dominance is renegotiated and how the sexual division of labour continues to be reproduced over time."* (Cockburn 1985, p43)

Table 1

UK Engineering Industry, estimated number of employees, analysed by occupational category and gender, April 1989

Occupation	Male	Female	Total
Managerial staff	121,840	6,604	128,444
Professional engineers, scientists and technologists	88,452	4,858	93,310
Technicians and technician engineers, including draughtsmen	161,463	5,869	167,7332
Administrative and professional staff	103,109	27,482	130,591
Clerks, office machine operators, secretaries and typist	41,863	132,372	174,235
Supervisors	80,068	8218	88,286
Craftsmen in occupations normally entered by apprenticeship	311,649	2,908	314,557
Operators and other employees (excluding canteen staff)	586,146	198,954	795,100
Totals	1,504,590	387,265	1,891,855

Note: Slight discrepancies may exist because of rounding.

Source: Engineering Industry Training Board, *Annual Report 1989/90*, EITB Publications, Watford, 1990

In the late 1980s we (the authors) interviewed women who worked as professional engineers in the UK and in the USA, to explore both the satisfactions they gained from their lives as well as the price they paid for their career choice. The title we chose for the publication of our work: **Women in Engineering: A Good Place to be?** (Carter and Kirkup 1990) reflected the ambivalence we felt after doing the research. Of the many issues that came out of the work, in this paper we highlight three that continue to be major reasons why women are not entering engineering: the engineers' experiences of sexism, sometimes even of harassment in the workplace; the problem of access to training and mentoring for career progression; and the issue of gendered values. These are issues which are difficult to address by explicit policy actions and they all merit further research.

The Experience of the Gendered Workplace

A woman engineer represents a living contradiction in the male working world of engineering. She has taken up an anomalous position, crossing from the private female world to compete in a public arena with men on their own terms (Imray and Middleton, 1983). In engineering workplaces, from which women have traditionally been absent, a woman engineer can be made, by her male colleagues, to feel that her gender matters, even when she herself sees it as unproblematic, as our respondents described:

> *The shock of being in a male dominated profession didn't really hit me until I started work....and it was a little bit of a culture shock for the men as well as for me... the fact that they reckoned that I was different. I didn't think I was - you know, I had never been a women's libber or anything like that - because I just didn't consider there was an issue - see what I mean? [laugh] It took a bit of getting used to... [UK water engineer]*

Men see themselves as 'people' (ungendered), but they see women as 'different' (gendered). The woman engineer may find that her work is more carefully scrutinised than that of her male peers or she may, occasionally, find that she is barred from working on certain projects because of a belief that a woman cannot supervise male workers, or because male workers refuse to be supervised by a woman.

> *I don't think I'm treated a whole lot, lets say, worse than the men. He [the supervisor] goes over my jobs with the same fine-tooth comb that he goes over theirs [male colleages] with. The way I feel sometimes is like you have to do twice as much to get half the recognition... but I can never say for sure that that's exactly what it is, because I don't think the men always get the best treatment either. [US electrical engineer]*

> *Then there is a big problem that I still haven't overcome; that one job I didn't get, or I wasn't even interviewed for, was in charge of manual labour. And there was another job which I*

didn't get. I was interviewed for it and I think ... a lot of the reason why I didn't get it was because again there was a lot of supervision of manual labour. [UK control engineer]

The woman engineer may feel that she has to exhibit more 'male', (or example aggressive) behaviour, than she would normally wish, in order to participate in the competitive atmosphere of the organisation. Almost certainly she feels that she needs to work harder and to prove her competence more frequently than her male peers. The way that she dresses and her behaviour at work must obey unspoken rules in order that she can pass as an engineer.

> *I conform ... The men wear suits with collars and ties, so I wear a suit. I have a female colleague who wears kaftans and strange things, but I conform because I think it gives a good impression and helps you get accepted as a professional .[UK gas engineer]*

For years the industry has used women in non-professional, servicing roles, and as a channel of communication between the client and the engineer. Many clients and engineers presume that if they are dealing with a woman they have not been given access to an engineer.

> *If it's those days when you're working round the secretary's desk and strangers come into the office they'll assume you're the secretary. [US communications engineer]*

> *[Clients telephoning] often assume you're the secretary without knowing and they will try to explain things in too much detail. [Then you] do a unit conversion in your head ... just to show you know what the difference is and do understand what they're talking about without saying: "I'm the engineer, talk to me." [UK mechanical engineer]*

For many men women's primary definition is the sexual 'other', regardless of her role. This can lead male colleagues to feel uneasy lunching or travelling with a woman engineer because because she is incorporated into their sexual fantasies. This highlights the pervasive nature of the sexual in the workplace (Hearn and Parkin 1987). pervasive because it is brought there by male fantasy not by the presence of real women.

> *One of my male peers said: "You know, I can't go to lunch with you." And he explained very carefully to me that he couldn't go to lunch with me because it would be viewed very personally by his colleagues. They would assume something was going on. [US nuclear engineer]*

Jokes with innuendo or overt sexual references and other sexual harassment, such as unwanted touching, are routinely directed towards many working women. While she may regard them as personally offensive, the engineer is likely to feel obliged to treat them as unremarkable in order to maintain her working relationship as a colleague, even where the overall effect is persistently to trivialise her status as an engineer. The quotations that follow represent escalating levels of harassment.

> *I haven't suffered physical harassment in a sexual way here but I feel that a lot of the office banter has gone beyond the acceptable point. One fella pretended he'd fallen in love with me and has made life for me very awkward. He has made it obvious to everyone in the factory ... and the fact is that at no time has this been encouraged ... I've found it very difficult... You cannot say that you object because, basically, you still have to get on with them and work. [UK electrical engineer]*

> *There's been the odd person who you've had to sort of freeze out and be a bit careful about what's between you and the door. [UK mechanical engineer]*

> *There's been, you know, hundreds of little incidents through my working life that have jarred... I hadn't been here more than a few weeks, I was in the little area where we made our cups of tea and coffee and one of the men from nearby came in and said :"You're looking very nice to-day; you're looking really rapeable." I just couldn't believe what I was hearing. [UK transport engineer]*

Policies on sexual and racial harassment are now being adopted by many institutions, but policies do not necessarily touch the unconscious construction people hold about sexual behaviour. More women now have protection from the most overt forms of harassment, but many men have become defensive about their behaviour rather than re-examining it. The possibility of an accusation of sexual harassment is now being used by some men to avoid a mentoring relationship with a woman.

Career Progression and Mentoring

A woman engineer expects a career with the prospect of steadily improving pay, the gradual accrual of associated benefits such as paid holidays, and advancement to work of higher status and responsibility. For both men and women the normal route to seniority in private engineering companies with a hierarchical structure is by moving into management. Engineers recognise that if they choose to stay in a technical position, higher status and pay will probably be closed to them. Typically progress is made through promotion into management in the same company, but the mechanism for finding and securing a new appointment is very variable. Some companies have a clearly defined and well publicised career ladder on their progress. In others, career support and advice are totally absent and advancement is a hit and miss affair.

The Policy Studies Institute (PSI) carried out a study of the policies and practices towards women employed as scientists and engineers in ten large UK companies known for 'good practice' in the field of equal opportunities (McRae, Devine and Lakey, 1991). Its report identifies examples of good practice in training and career progression which appear to work at present, such as individually tailored job-related training programmes and the provision of special training for women with managerial potential. It also highlights the difficulties of women who choose to work part-time. Many companies, while now implementing career-break schemes for their women employees, are still resistant to the idea that technical positions and particularly the more senior ones, can be covered by part-time work or job-sharing. It remains part of corporate culture that to succeed, one must always put one's career first. More flexible approaches are only being introduced very slowly.

Women engineers often find that they have more difficulty than their male colleagues in obtaining management training, without which they are unlikely to get a management position. In Britain this difference applies to training at all levels (EOC,1990). Inevitably, her low priority in the queue for training slows down a woman's career progression. In the male dominated environment of engineering it is depressing but not surprising, to see that women engineers rise slowly and infrequently to senior management positions. Few of the companies in the PSI study had women in senior management and none had a woman executive on its board.

However, promotion prospects are enhanced for people who are mentored, that is guided and promoted by senior staff. Mentoring in its crudest form is the perpetuation of an 'old boys' network' where opportunities are only open to a specially select few. Mentoring in an equal opportunities form entails support and guidance in an open and negotiated relationship and is now actively promoted in some companies. Eileen Byrne at ICWES 1991 presented controversial research which suggested that our enthusiasm in GASAT for role models has been misplaced, and that we need instead, in both education and industry, is the active involvement of men, mentoring women:

> *"It is time that we passed the responsibility for helping women's progression firmly to the males who dominate higher education. We will not produce more generations of Kovalvskaias by leaving it all to the handful of already overworked minority women" (Byrne, 1992 p8)*

In our own work we searched to uncover key role models and we found few. Instead we found important relationships with helpful men, brothers fathers and boyfriends who were effectively mentors

Conflict of values

In GASAT in particular, but also in the feminist critiques of science and technology there is a continuing debate about the gendered values of engineering. That engineering embodies masculine values, even masculinity itself, is now accepted by most feminist critics. When we involve more women in engineering are we working towards an androgynous engineering incorporating men and women in some ungendered way, or are we working for the incorporation of particular female values which would be in conflict with, or replace, the present masculine ones? Our answers *will reflect both our model of engineering* as well as our model of gender.

Gilligan (1982), Fox Keller (1983)and Harding (1986) have all been influential in arguing for the special nature of female values. Carol Gilligan describes male values as about " the role of separation as it empowers and defines the self" and female values as " the ongoing process of attachment that sustains and creates human community" (Gilligan 1982 p.156). Methods of scientific enquiry have, historically been premised on engaging in psychological separation; subject from object, technique from responsibility, spiritual from material; this is a distinctly male framework. Some of our interviews were carried in 1986, shortly after US space shuttle exploded on lift-off killing all its crew, and after the major nuclear accident at Chernobyl, the lethal effects of which will be felt for many years yet. We looked for conflicts of value in our interviewees in response to these disasters. Although they were worried most remained committed to the notion that engineering contributed to "human progress".

The greatest enthusiasts were in fields such as water engineering which allowed women to retain their idealism. Women engineers working on military projects felt most internal conflict between their work and their values. None defended the production of weaponry, yet they continued their work and found ways to block out recognition of its uses until forced to acknowledge them, for example by media reporting of wars.

> *Something I would like to have more time to [think about], so I could have an opinion, would be with respect to a lot of military issues that I'm involved in on a day-to-day basis. I think there is a lot of room for confronting them if you had time to think about it and get educated. A lot of the things I'm involved in worry me when when I think about them long enough ...I'm*

> *embarrassed about it. I'd really like to say something. [US civil engineer]*

Gilligan suggests that its hard for a woman to retain a position in which she denies her responsibility towards others. One engineer worked in the nuclear power industry. Her need not to feel responsible for work which might be related to nuclear disaster led her to feel alienated from all forms of politics and to avoid all discussion about nuclear energy.

> *I don't think I'd work here if I disagreed with nuclear power. I'm not very sure about nuclear bombs ... I don't like getting into discussion on the pros and cons of nuclear power or nuclear - full stop. [UK mechanical engineer]*

Young women engineers have undoubtedly reaped some benefit from social and cultural change brought about by the last twenty years of feminism, but they are still unlikely to identify themselves as feminists or take particular pride in being a **woman** engineer. They are also concerned not to claim special consideration because of their sex. They tend to deny that they have experienced any discrimination at all or that their lives have been more complicated than those of their male colleagues. Our work was with women who remained in engineering,, and it is therefore not surprising that these women were more likely to have absorbed the values of the profession, even if these are male.

Summary

Despite all the practical initiatives of the last 20 years to recruit more women and girls into engineering the profession remains a male ghetto. This fact validates the more radical feminist critiques and suggest that we need to do more work on the deep mechanisms of gender such as psychology and discourse to uncover how despite our best efforts, the situation continues to reproduce itself.

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SOCIAL-ECONOMIC POSITION OF WOMEN OF SIBERIA DURING THE CRISIS

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Influence of science upon development of technologies possible to examine in various aspects: first, technologies connected with producing of output, second, formation of new values and knowledge of people, who produce output. Didactic technologies have relation to the second aspect.The aim of my paper is to put the problem of specific of women's question in Russia and to form knowledge about modern Russian women because now you can't find such knowledge at no one of textbooks by sociology.

Crisis in Russia increases the discrimination of women. This process was latent before because there was substantial discrepancy between the real and declared women's rights, Now this process is evident. I'll try to prove that on the example of Tomsk region (Siberia). At the beginning of I992 89 per cent of our all unemployed were women as the result of the reorganization of our enterprises. According the forecast I/4 share of women in Tomsk region having under age children will become unemployed. They will lose social guarantees, the places at the preschool institutions and permits to sanatoriums. Now the men occupy top level of power structures and they don't consider women's problems as serious ones. There are only 5 per cent women in Tomsk region parlament (Soviet). First of all the economic crisis will impair the women's rights because they were discriminated and didn't have the real rights before.

If 5 years ago Russian woman was told that she would be unemployed this fact seemed incredible to her. In Soviet Russia during many decades she had a right to stable labour. As a last resort she was able always and everywhere to get unskilled hard work (for example as railroad worker) or low pay work (as ordinary engineer at industry plant).

During last 2 years the situation has been sharp changing. Economic crisis, growing of social and national tension, aggravating of sociopolitical conflicts affect women's position negatively. Now women deprive of main guarantee--right to labour and impetuously supplement the ranks of unemployed. Analysis of current situation will require from us to research the problem of gender relations. The culture of gender relations in Soviet Russia was determined by three dimensions in women's positions:

1. imaginary equality between woman and man;

2. displacement of role identification in family;

3. discrimination and loss of social guarantees under conditions of socio-economic crisis. Investigation these three dimensions area gives the opportunity to understand the specific position of Russian woman and to compare values and expectations of women and also standards and expectations which our society produces to women in crisis.

I propose some hypothesises:

1. Previous experience complicates the adaptation of women to new rigid conditions and considerably will determine women's behaviour in emergent situation of impetuous reduction of working places at the employment market. Bewilddment of women may induce them to extremities: now there is considerable reduction of birth rate.

2. In fact during last decades women had dominated positions in long list of occupations from industry to medicine. Next time the occupational list of women will greatly diminish. Labour stability of women would keep under circumstance of modification of structure of labour division and emerge new for Russia occupations, first of all in the field of service.

3. Last decades role position of women was ambivalent. In family woman as usual performed the roles as masculine and female, often she was at the head of family. And there was discrepancy between real woman's state and declarating equality in labour between man and woman. The woman was economical independent and simultaneously had dependent position. Now declaration of equality between man and woman disappears. The freedom of choice of various occupations emerges but real chances for woman to get work fall. Women have to "pay" for freedom.

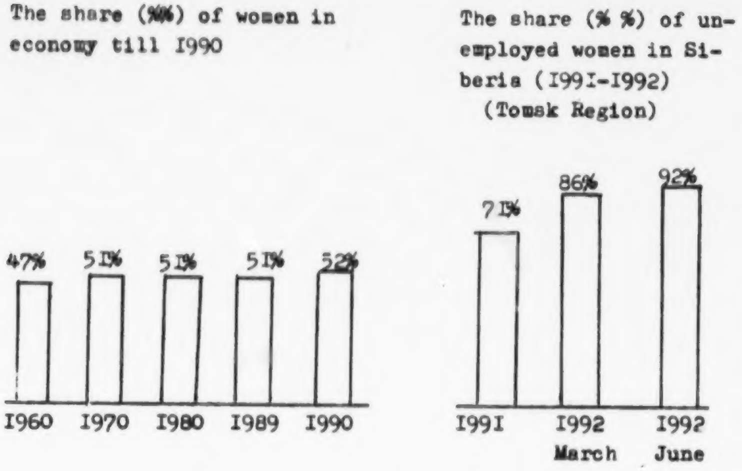
4. It may be possible that in future Russia will be expecting"women's depression". Activity of women's movements and organizations as subject of social action, special policy of state and private organizations will possible remove tension.

Dynamics of women's employment

Documental method and statistical analysis through Russia were used for study of dynamics of women's employment (Economy. Russia Socialist Republic in I990. Moscow.I99I; Statistical data, I990. Moscow. I99I). Also statistics through Siberia (Tomsk region, I99I,I992) were used (Statistical data of Tomsk centre of employment for I99I-I992) Unfortunately statistics data concerning Russia (I99I) haven't published yet. However these data are very essential because current processes in Russians society change quickly. Now for one year more changes happen that before for ten years. Comparative statistical analysis concerning Russia and Siberia is reliable because general tendencies of processes in Russia prove it be selectional researches in Siberia. Share of women among population of Russia in I990 amounted 52 %. Predominance of women's number over men's number comes to the age of 30 and older.

Predominance of women's share among the population of country may have influence on employment structure of population, however this fact isn't basic. Women's employment in economy was traditionally high and had a tendency to insignificant but constant increase till I990 (52 %). The situation has been changing greatly since I99I when in Russia economico-organizational changes began concerning with transition to "mixed" economy (plan + market). Emergenceofmarket elements gave rise to competition. Now in the labour market women have to give way for men. The share of women among unemployed amounts to 92 % in I992. The women's position changes following: firm increase of share of women among employed drastically reduced in I99I-I992. Mainly women supplement the army of unemployed. In I99I 70 % unemployed of Russia were women, and on June I992 in Siberia women amounted to 92 % among all unemployed in Siberia. Figure I illustrates these processes.

Figure I



The share (%%) of women in economy till I990

The share (% %) of unemployed women in Siberia (I99I-I992) (Tomsk Region)

Such striking changes may be explained by some reasons:

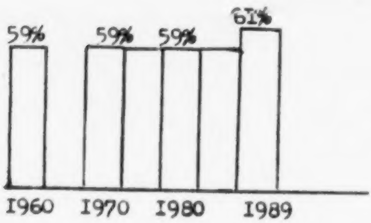
I. Last decades we had latent unemployment, which gave opportunity the share of population to get "social rent" - to receive money, not earning it. Now latent unemployment becomes evident.

2. Now there is a necessity of rapid replacement of out-of-date technology by modern, so unskilled workers (first of all women) become unemployed.

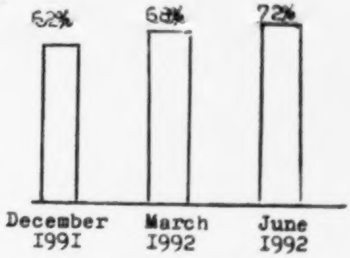
3. Former military men and workers (mainly men) from armament plants emerge at the labour market. They actively push out women from labour market. The tendencies are the same when we analyse the problem of women's unemployed with high education (Figure 2).

Figure 2

The share (% %) of women among total number of specialists with high and special education till 1989



The share (% %) of women among total number of unemployed women with high and special education (Siberia, Tomsk region)



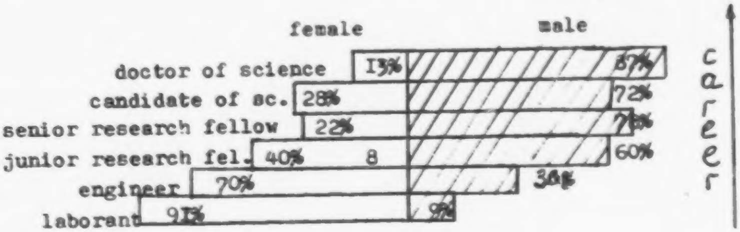
Statistics analysis gives the opportunity once more state opposite tendencies and 1990 is the point of division. Till 1990 the share of women in economy with high and special education increased (to 61%). The opposite tendencies emerged from 1990: growth the share of unemployed women with high and special education (72 % - June 1992). The share of unemployed women with high and special education increases every 3 months at an average about 5 %, first of all owing to reduce so called "rent places".

Science on the shoulders of women

In Soviet Russia one thing is achieved, that one, women of the West desire to achieve. In different kind of scientific institutions, in educational, academic, specialized ones women make some 47 % of staff employed. The defence - oriented fields are, of course, an exception.

However, the considerable proportion of women employed does not reflect the general feminization of science. The inequality of women is expressed in them being used as a source of cheap labour force. This is a characteristic of natural and engineering sciences in particular. The low ranks of positions occupied, low wages, executive jobs mostly, the career being less successful than that male are an indicators of such an inequality. Promotion of woman, her career in science are shown in figure 3. Obviously that women in science occupy mainly executive low posts, 91 % women belong to the group of service personnel, 70 % - amount to the group of engineers. Only small share of women reaches top level of career. Women fulfil toilsome necessary work setting free time for men for them successes in science

Figure 3



The real inequality is caused by the domination of male values in scientific activity. It stimulated preference for the primary development of pragmatic fields of research, which are especially typical for a soviet science and leaves no room for the approaches concerned with the quality of living. This is the cause,perhaps,of soviet science possessing especially advanced technologies in military fields only.

Hypothesis offered claims that in the case of a mass society the gulf between male and female values is widening critically. Consequently, the danger of a strong confrontation within soviet science comes into existence.

Positive influence of feminist values within scientific area will stimulate the development of motivation for the research concerned with the problems of man an environment in conterbalance for an ambitious inducements towards action, characteristic of the male values, stimulating the research at the military and industrial spheres priw aliry. Female values within the scientific activity may change priorities. Major changes of the paradigm of a Russian science I, personally, see in close association with a development of a female values and their harmonious combination with a male values. The symbiosis will weaken the pragmatism of a societ science and will widen its humanitarian spheres.

Outlook

In conclusion I want to stress that Russian woman has future and past but has no present. Crisis in Russia break up not only social institutions (economy, army, education) but change also standards and values. Imaginary equality between men and women breaks up too. New feminist values only begin to form. Important role in this process belongs to feminist education, development of scientific theories of social women's movements, researches of socio-economic aspect of women's lifes. These moments promote the development of social reflection of Russian woman and make her more active. "The hand of help" from world women's community assists her in such severe situation.

THE IMPACT OF NEW TECHNOLOGY ON MEN AND WOMEN

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The impact of new technology on the development of human society is widely known. Its comprehensive effect on all spheres of economic, political and social life became one of the main subjects for the researchers (especially since the 60s). There were published many books on this theme. But the problem of impact of new technology on gender relations is relatively a new one and it became the theme for the research of the International Project carried by the Vienna Centre for Coordination and Information in Social Sciences. The author of this report is one of the participants of this project.

First, it was necessary to find out how male and female labour are influenced by new technology; who gained more from technical innovations: men or women; what are the links between new technology and gender relations at macro and micro level.

A specific feature of scientific-technological progress in the polistructural economy of the former Soviet Union is that various economic branches simultaneously go through the process of mechanisation of manual jobs. This involves the introduction of automation and the use of the latest achievements in science and technology such as electronics, micro-electronics, computers, robotics and flexible systems.

The country is lagging behind many other countries in technical equipment of industry (40% of work done manually in industry). However, the introduction of new technologies, essential for economic development affects men and women in a different way. Their abilities to develop new technology in their own interests and those of society differ for a number of reasons. This is rooted in historically based differences in the forms and spheres of men's and women's labour. The most widely-spread cultural stereotypes, strong patriarchal influences in society, the overwhelming prevalence of men in all echelons of power, especially at the top, have resulted in weaker ties between women and the technological kinds of employment and prejudice in regard to the application of new technology.

Till recent time all enterprises belonged to the State. The command-bureaucratic authoritative administration decided what kind of new technology should be introduced and where. Women practically didn't participate in these decisions. At the macro level we may retrace the direct connection of authoritative structures and the way new technology was used in the interest of certain social groups according to sex.

The division of industry into 'male' and 'female' branches was apparent from the beginning of the involvement of women in public production after the October Revolution. Historically, preference was given to the development of heavy branches of industry ('male'), connected with engineering and weapons manufacturing where the latest technical achievements were used and the best specialists are concentrated. The vast majority of them are men.

Instead of using new technological innovations for the satisfaction of people's needs they were used for military purposes. It is one of the main reasons why the economy is in deep crisis right now. But this is a crisis of overproduction of weapons and underproduction of consumer goods for people. Such State policy has resulted in technological lagging behind in light industry, where the female labour force is concentrated, leaving it in deep crisis.

The food industry and social services: medicine, education, culture and trade are similarly affected. From 60 to 90% of the labour force in these industries are women. More than 40% of work in these branches is done manually by women for low wages - the lowest in the country. The immediate replacement of out-dated equipment with the latest technology is badly needed. However, management at the decision-making level (practically all men doesn't seem to be in a hurry to make investment into these branches. It is more profitable for the state-owned enterprises to use cheap female labour instead of expensive new equipment.

According to the Central Bureau of Statistics, women make up 30 to 50% of those employed in heavy industrial work. In agriculture this is 98%. About 30% of women industrial workers are employed at jobs not covered by safety legislation.

If the introduction of new technology relating to mechanisation and automation is continued at the present pace, women will be taken out of heavy manual jobs only in 50-70 years.

Thus, there is a situation in which scientific and technological progress finds extensive application in 'men's' industries and only slightly affects the industries where women's labour prevails. Thus it has little effect on the number of women employed at hard manual jobs, nor does it positively affect their labour activities or conditions of work.

Even where new technologies are used in the design of new equipment women's needs are not considered. New machinery is designed exclusively to be used by men. As a result, women are forced to suffer, working in uncomfortable positions during the whole working day, leading to a loss of productivity and efficiency. Such losses amount to 13-20%.

Gender aspect of technological innovations at the level of enterprises may be also observed in further division between male and female jobs. The plant 'Krasny Proletary' can be an example. When a new shop supplied with electronic equipment was created, the recruitment of highly qualified workers was announced, but exclusively for men from 25 to 35 years old with higher or specialised secondary education. Women were not taken on except as shop-cleaners. This discrimination practice gave rise to resistance from women-machine operators working on old lathes. One woman - a veteran who had been working on, and caring for, her lathe for 40 years - demanded that she should keep the lathe and its working space for as long as she was fit to work. Administration was forced to comply with her demand.

The researcher of women's problems L.Yuk points out that in the system of production of economic and public relations, there is a contradiction between the formal economic equality of women and men in relation to production tools and their unequal opportunities to exercise this right. Women usually are hired to work new technology in second rate or auxiliary roles. Men do master jobs.

Authoritative hierarchical structures on which posts are filled by nomination leads to the appointment of men to higher ranking posts, irrespective of their competence and educational level.

As a result, in spite of the higher educational level of women (they comprise 61% among those who have higher or special secondary education), they occupy only 7% of decision-making positions. Practically each second man from this category occupies leading posts. Moreover, 50% of men occupying managerial posts don't have higher education. The fact that the economy was headed in many cases by incompetent people, aiming to preserve their privileges and opposing the introduction of innovations, is one of the serious causes of the deep economic crisis.

In the transition of enterprises towards a free market, administration has a possibility to moderize and to introduce new technology. A resulting reduction of labour force is at the expense of women. They are considered as a less desirable labour force in comparison with men, demanding additional social expenses, if they have children.

Thus the introduction of new technology is often used by the administration against the interests of women and leads to a rise in the unemployment rates and aggravation of social conflicts in the society.

If before perestroyka there was not a problem to find a job, just now the situation has changed dramatically. Women constitute 80% of the unemployed. More than 70% of them are women with higher education from 30 to 45 years old. There are many engineers among them. It means that high professional level and education can't guarantee jobs for women.

It is also a great problem to find a new job for low skilled women who were laid off because of the introduction of new technology.

According to statistics, of the total number of women relieved of hard work and hazardous work in industry, more than 30% have changed their jobs to new ones with similar working conditions, and for another 30% working conditions have worsened. Only a little over 30% have improved their working conditions.

This is blamed mainly on inadequate training and low skills of women workers as well as re-training difficulties.

New technology and its influence on women's professional level.

As with all processes, the introduction of new technology has advantages and disadvantages. There have been qualitative changes in the Soviet women's educational and professional standards. Of 1500 professions, women are currently studying 1000, excluding those that have adverse effects for their health.

In 1941, there were 864,000 women in the national economy, in 1960 - 5189,000, and in 1986 - 20757,000. Among specialists with higher and specialised secondary education by the end of the 1980s women made up 58% of engineers, 67% of doctors, 87% of economists, 89% of book-keepers, and 91% of librarians and bibliographers. A noticeable growth in educational and professional standards has enabled many women to do well in such a complex and untraditional field as management - about 26% among leaders in the national economy are women. They are directors of enterprises, production or scientific-production associations and different kinds of other small enterprises. At the same time analysing conditions for women to master new technologies, it is important to take two factors into account: among women with specialised secondary education, the activity of 60% is based on a relatively small volume of scientific and technical knowledge. On the other hand, humanities' workers prevail (teachers, medical workers, planners, economists, trade workers).

The recent introduction of new technologies into 'male' branches of industry has been accompanied by gains for some women. The number of highly qualified women has doubled in engineering, the radio and electronic industry and electronic and automatic machines manufacturing as well.

For the majority of women in the precision instruments and radio industry, however, where they make up 65-70% of workers labour is rather tiresome and monotonous. It includes a great number of operations such as assembling, demand a great deal of precision, attention, accuracy-qualities more inherent in women than men, and men do this work reluctantly.

The use of computers, electronic and microelectronic equipment led to the appearance of new professions among women such as programmers, perforators, main and auxiliary operators, etc. Women make 50-60% of these. However, women are occupied mainly with auxiliary operations in these spheres.

The press and studies have repeatedly noted recently that female specialists have not been employed in full, and even more important, they have not been employed under optimal terms. The gap between their standards and those of men has been increasing, despite equal education opportunities from the start. According to a study of a number of industrial enterprises, women have been promoted to managerial posts at a slow pace.

The mastery of new technology by women is seriously hampered by a number of factors:

- there is no adequate system of training and retraining
- 40% of all women employed in the national economy are in unskilled work and in sectors of industry where the mechanisation level is low
- women are extremely busy exercising many duties simultaneously.

Excessive household duties make it very hard for women to raise their professional skills and acquire experience necessary for new technology. Household duties take up 275 billion hours annually while only 250 billion hours are spent in the national economy. Women spend 30-40 hours a week on housework as compared woth 10-20 hours by men. This means that work at home where mechanisation is virtually unavailable is a second shift for women. Only 15% of house work is done with the help of machines (vacuum cleaners, washing machines, refrigerators). Only some families have microvens or dishwashers. After the liberalisation of prices (since the 1st January 1992) many families reduced the number of services which they used before, because they can't afford to pay high prices for them. It means that the amount of house work increased especially for women. This sharply reduces the time women can devote to their health and their intellectual growth. An obvious disproportion in the degree of participation in household activities indicates that the traditional stereotypes of men's and women's behaviour have not been overcome in society. More than that, these stereotypes have transformed in a peculiar way. Youth today take it for granted that women are fully employed in the economy and at the same time are housewives, wives and mothers. Obviously, a direct result has been the unbearable physical and mental stress that has affected women. A selective examination of 51,000 workers' and farmers' families in 1989 showed that women employed in industry could devote 11 minutes a day to study or raising their professional skills on working days, on weekends - 8 minutes, female farmers - 3 and 3 minutes respectively.

Assessing women's opportunities to take part in the technical renewal of production in full by upgrading their professional skills, one cannot ignore the fact that over the last decade, as a result of a divorce explosion (nearly 1 million families break up annually), there has been a catastrophic rise in the number of women, raising their children on their own. Mother families', headed by women comprise 8-9 million today. Women in such families are exposed to even greater personal and material pressures. To change work by upgrading their skills - and this takes time and effort becomes increasingly problematic.

Even considering all these difficulties and that complex problems exist, we stress that the technical modernisation of all economic branches, including public services and recreation facilities, provides an opportunity that, with a correct approach, could make women noticeable better off and could progressively change the professional and industrial structures of women's labour.

The application of advanced western technology and equipment to the light and service industries makes it increasingly necessary to train and retrain skilled workers in their industries. They are also the industries in which women workers prevail. Where such equipment is to be installed account should be taken of the experience of similar facilities in western countries in order to overcome the difficulties facing women in transition to new forms of labour. The role of trade unions and management should be noticeably enhanced in this process to take the interests of women into account in full. It is also essential to make women more involved in decision-making, concerning the introduction of new technology, in order to create favourable conditions for women.

Considering the particular importance of professional training, studies should be held to find out the extent to which professional orientation affects young women, at what age such orientation should be conducted and in what forms and how professional training relates to subsequent work.

Where benefits for working mothers have been introduced they have been used by only 1-3% of women. Flexible working has only slowly been adopted. Unfavourable attitudes to women on the part of management have been blamed.

When a new technology is selected and priorites for its application in productions with predominantly women's labour are set, it is necessary to strictly consider criteria such as easier working conditions, better hygienic conditions, shorter working hours, and higher production efficiency. It is necessary to work out and put into action a system of administrative, legal and educational measures to guarantee women's equal access to jobs, using new technology.

Summing up the influence of new technology on female labour force in the sphere of manufacture, we can conclude the following:

1. It reduces the number of women operating in manual jobs
2. New technology gives an opportunity to acquire new, more interesting professions, to advance qualification level and to improve skill.
3. New technology makes women bear the responsibility for their work, makes the work more interesting for them. On the other hand, for the majority of those working on the new equipment there is an increase of stress.
4. In spite of the improvement of labour conditions and safety measures, the majority of women as well as men consider that the new technology negatively affects their health.
5. New technology leads to the growth of labour productivity, which gives the possibility for administration to increase workers' wages. However, the gap of about 30% between women's and men's salary is still preserved. The higher level of wages associated with new technology attracts women specialists from other spheres - teachers, accountants - in which the level of wages was much lower.
6. New technology leads to further deepening of the male and female labour division. The possible opportunities for the advance of women are generally not taken up. Men still control electronic and technical equipment. New 'female' professions connected with the use of computers, such as programmers, operators, perforators are of subsidiary character.
7. Introduction of technical innovations makes earlier skills redundant. This affects many women around pension age, for whom it is very difficult to adapt themselves to the work with computers, electronics or micro-electronics.
8. Many women are laid off, the others move to service the economy, but at a lower job level, which often doesn't correspond to their professional skill. This means that the general professional level of female labour force becomes lower, and the gap between men's and women's professional skills increases.
9. As a rule, introduction of new technology leads to structural unemployment; women are the first victims of such structural changes.

To make women's economic contribution more efficient, many researchers suggest a number of measures, the most important of which are the following:

1. To expand the introduction of new technology, automate and mechanise work places where women work. Carry out new technology with an eye on women's special ergonomic needs.
2. Set up the training and retraining of women in the workforce.
3. Teach women a new profession to transfer them in the future to jobs that do not involve hard physical work.
4. Select jobs where women can be employed in shorter working hours or at home.
5. Create necessary conditions so that women can optimally combine their mothering duties with work and public activity.
6. Relieve women of hazardous and over strenuous work; see to it that the law banning the employment of women at hard jobs is strictly observed.
7. Guarantee the retention of jobs for which women are employed in shorter working hours.
8. Widely introduce flexible working regimes for women.
9. Reduce a working day by one hour for women with 2 or more children and provide them with an extra paid day-off a month.
10. To re-consider production norms for men and women by taking women's phyisiological peculiarities into account.

In order to implement these points into life it is necessary to create the State Programme. Such a Programme was worked out by the Ministers of the former Soviet Union together with the scientists from the Academy of Sciences. But it doesn't exist any longer. The new Minister of Russia is trying just now to work out a new Programme for the defence of women, children and to protect family interests.

II REFLECTIONS ON GASAT WORK IN THE FIELD OF EMPLOYMENT

8 Restrictions and strategies in career development

"Sjhhhhh Mommy is reading"
- or Work and family issues affect us all

Marja Brand
Eindhoven University of Technology, The Netherlands

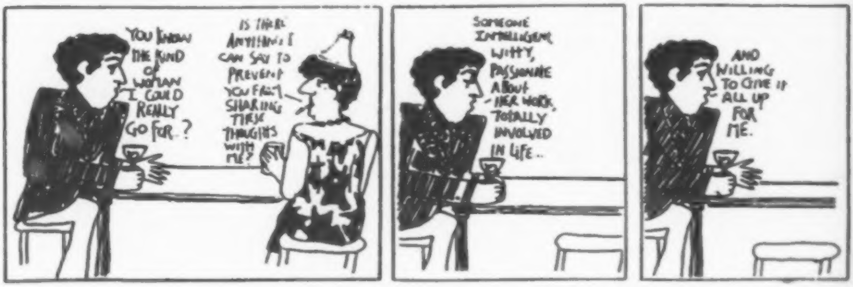
The present generation of university and college students expects to "have it all" and live happy ever after. Becoming succesfull in your (technological) career and becoming a happy person at home and in your free time is something like being able to carry three watermelons with two arms.[1]
In this paper I will discuss strategies to survive at home, at work and in your spare free-time. A survival manual is given for men and women to succeed in dual career partnership, one of the major social changes of the century.
Work and family issues affect organisation in more than one way. Child care is an example of such an issue. There are more areas in which work and family issues may have significant impact on organisations and a number of possible actions is stated for companies to support families instead of employees only.

> *"In the early days, when the kids were still young, I could take home some of my work and finish things. Now they are growing-up and it doesnot work anymore. It seems to me that we managed to raise them to hush when daddy was working, but forgot to tell them that mothers need silence to read as well. They act as if mothers were made to disturb, every hour of the day!" (a female technician who cannot take home the paperwork she did not finish at the office. Her male collegues can.)*

What has kept the system running in the past is the fact that most wives and mothers did not have careers - not in the sense that husbands and fathers do. Their jobs were clearly subordinated in their own minds to husbands' careers and family priorities. Even if their wages were necessary to make ends meet. This has allowed social institutions to remain rooted in the premise that breadwinner husbands and homemaker wives were the norm.

The division of household labour, the way we care for our children and our orientation towards work are major changes in the last decades. Although there are a lot of problems to face, logistical crises to overcome, identity problems to workout and conflicts to fight over the dual career partnership is coming into sight.

"There is nothing like a dual career couple that's functioning well. Each person has a sense of control of her or his life. No-one is feeling helpless or trapped by the other one's dependency. Each has the other to respect, care and feel proud of."[1]


YOU KNOW THE KIND OF WOMAN I COULD REALLY GO FOR?
IS THERE ANYTHING I CAN SAY TO PREVENT YOU FROM SHARING THESE THOUGHTS WITH ME?
SOMEONE INTELLIGENT, WITTY, PASSIONATE ABOUT HER WORK, TOTALLY INVOLVED IN LIFE..
AND WILLING TO GIVE IT ALL UP FOR ME.

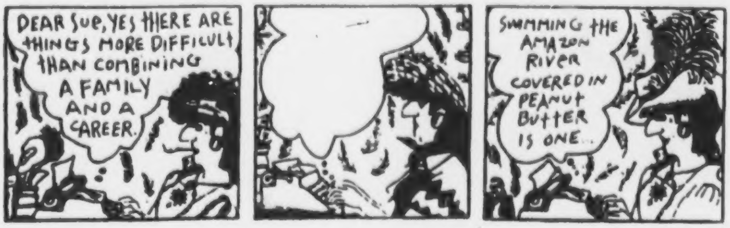
Shared responsibilities

Somehow men have not found a coherent feeling about carreer-oriented wives. They may say they have as much respect for a wife who stays home, but in reality they don't and on the other hand they may think positive of career-oriented wives but not want to live with them.

Expectations may be changing, but surveys show that couples by and large modify attitudes more than behaviour. More than half of a United States poll said that husband and wife should take equal responsibility in preparing meals, but in fact the wife did the cooking in three couples out of four. It is frequently difficult to seperate what couples think is the nature of their work arrangement from what actually happens in day-to-day lives.[3]

In their book The two career couple, Francine and Douglas Hall discuss the different types of partnership they studied. They found that "accomodators" and "allies" function best, at least with a minimum of conflict. "Adversaries" and "acrobats" lost in the end because of the pressure on the partnership.

(Accomodators = couples in which one is responsible for maintaining home and family while the other pursues a career.
Allies = couples who simplify their lives by setting mutually acceptable standards that are easy to meet.
Adversaries = both have conventional standards for career, home and relationships and presses for the other to provide the support.
Accrobats = try frantically to have and do it all.)


DEAR SUE, YES THERE ARE THINGS MORE DIFFICULT THAN COMBINING A FAMILY AND A CAREER.
SWIMMING THE AMAZON RIVER COVERED IN PEANUT BUTTER IS ONE...

Career and family commitment: Tips for partners

To make it work dual career couples could recognize the following strategies':

1. Discuss expectations, priorities and needs openly.

Do not rely on a tacid assumption that your spouse's expectations are the same as yours or that your partner is telepathic. It is amazing how many people do not foresee that a career as a technical consultant will be at odds with a spouse's need for a lot of togetherness. It is equally amazing how many people assume the other one is going to clean the toilet.

2. Be realistic about what each of your careers entail.
How mobile is each of your careers. Do they tie you to Bangkok, Amsterdam or Vienna? Ask the hard questions in advance:
What if we couldn't both find good jobs in the same city? Does it matter who makes more money? What if one of us felt like chucking the career?
Meanwhile learn about each other's work to be sympathetic, share your hopes and triumphs, but don't overload each other with details. Develop confidents at work to discuss the nitty-gritty with.

3. Talk to other people who have a similar lifestyle.
The importance of peer-support is essential. Whether your friends say "Hey great, you are taking Pim and Francine to the zoo" or "You mean she's stuck you again with the kids?" can make all the difference. Unless your need for community approval is very low, think twice about settling a two career family in a conservative area.

4. Be realistic about what you can accomplish.
Recognize that two of you are trying to do what used to be considered three full-time jobs: two careers and a home and family. Piano lessons, making a lot of money before age 40, run movies, nights out, spontaneous visits, tidy bathrooms are things other couples have learned to forego.

5. Schedule time to be together, to be alone and to relax and do nothing.
It may sound unspontaneous to plan these things but it may be the only way to prevent yourself from trying to remember when was the last time you said anything significant to each other. Eating out sounds great, because at home there's always the phone to answer or that broken chair to fix.

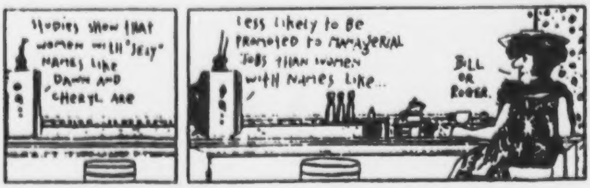
6. Delegate some of your family responsibilities.
Including things you take pride in like cooking, gardening, sending birthday cards. There's not enough time in a day. Also have back-up plans for unexpected situations such as family illness, strikes and business trips.

7. Speak up about the adjustments that are needed to make the impossible work.
Raise issues with your employer, your government. Someone has to do these things.

Career and family life

To those who point out that two-career couples are a threat to family life we can say it is not women's participation in the labour force that is becoming incompatible with the concept of family. Rather it is **careers as they have been traditionally understood.**

The two career partnership is a lot of work and the reward lies mostly in areas that do not show up in the images of the popular cultus. The emphasis in studies on partnership has been too much on individual solutions[8], but real institutional change is needed. In future men and womeh must co-operate in the search for solutions on a larger scale.


Studies show that women with "sexy" names like Dawn and Cheryl are
less likely to be promoted to managerial jobs than women with names like...
Bill or Roger.

Career development?

Men who are truly committed to being equal partners with their wives in home and family reponsibilities and to giving equal priority to their wives' careers recognize that this could mean slowing down their own career development. Sad to say is that men who share on a 50-50 basis in home and family tasks report feeling somewhat isolated. Commitment to career is suspect and other men look down on them for doing household labour.

Executive guilt: Who's taking care of the children?
Management psychologists agree that nothing tugs more insistently at executive psyches these days than the fear of shortchanging the kids. More and more parents are asking whether the higher salary, bigger title or the extra professional recognition can make up for leaving toddlers in tears each morning or returning to a teen who is hurt and angry each night. Even parents who can affort the best childcare worry that it will not provide the warmth and doting attention they remember having as children or imagine to be possible. In a study of corporate women officers the respondents ranked quality time with children as the primary personal sacrifice they made because of their career[6].

Corporations are beginning to discover that more and more of their most valued employees are willing to sacrifice work time, productivity and possibly careers to devote more time to family matters[7]. Fathers are sharing not only family responsibilities but also the worry, stress and guilt associated with leaving the child in someone else's care. Nearly 30 % of men in a Fortune survey said they had refused a new job, promotion or transfer because it would have meant less family time; 25 % of women gave the same respons. The survey showed that childcare responsibilities take a toll on productivity: some 41 % of parents lost at least one day's work in the three months prior to the poll to care for familymatters - tending a sick child or going to a school performance - and nearly 10 % took three to five days off.

These figures make it clear that companies are tied to the childcare problem on way or another.

How do work and family issues - not only child care issues! -affect organisations?

The concept of work-family relationship brings to mind problems that arise in accomodating child care needs. Reconciling work and family responsibilities is however not only a working parent issue, it also involves workers - both young and old - without children, who have other types of family concerns. It is not only a dual career issue, it concerns working couples at all income levels. It is not only a "women's" issue, it affects workers of both sexes.

Some areas in which work and family issues may have significant impact on your organisation include:

absenteism
turnover
recruitment
plant closing
work force reductions

plant siting
boom-town impacts
relocation policies
quality of worklife
participative management

personal time off
vacation policies
tax credits for child care
child care centers
information and referral

after-school child care
summer camps
sick child care
dependent care assistence[1]
maternity and paternity leave

parental leave including adoptive parents
personal family leave
social service leave to aid community organisations
family education seminars
investment in training

employee benefits
union health and welfare funds
flexible benefits

salary reduction
employee counseling

stress management
time management
alcohol and drugs abuse
parenting seminars
wellness programs

health care costs containment
fitness programs
health promotion
tuition assistance
pre-retirement counseling

phased retirement
compressed workweek
shift work
overtime
flexitime

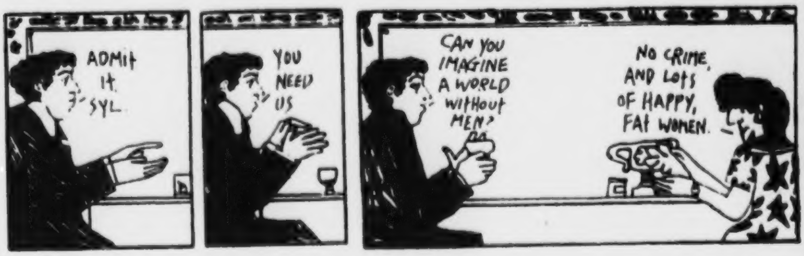
part-time work
job sharing
summer hours
work at home programs
community relations

corporate contributions
business-community partnerships'

The list mentioned above is not covering all areas possible. My imagination is not big enough to cover it all. The main task is to direct the discussion towards an understanding of the organisation involved in carrying the three watermelons. Based on a realistic picture we can create structures and policies needed to balance work and family life for everyone.

True equality

If women accept succes to the same extent and in the same way that many men do, the problems will be enormous. If women simply adopt the number-one-ism that dominates the workplace, the drive for achievement will probably lead them into the same narrowing and unpromising obsessions that destroy many men. A more egalitarian society in terms of the distribution of income and social respect would make it easier to escape number-one-ism. Meanwhile we shall have to struggle with the values that surround us and try to create true equality in the home and the working environment.


ADMIT IT SYL.
YOU NEED US
CAN YOU IMAGINE A WORLD WITHOUT MEN?
NO CRIME, AND LOTS OF HAPPY, FAT WOMEN.

1.Dr. Dimitrina Petrova, Geldrop, april 1992

2.Schwartz P., Blumstein P., American Couples William Morrow, 1984

3.Schwartz P. and Blumstein P. 1984

4.Barret K., Ms Magazine june 1984

5. Feminine accomodation guilt said women needed to try harder to make it work; feminist anger said men needed to change to make it work.

6.Heidrich and Struggles in Fortune 6, 1987

7. Fortune survey of 400 men and women with children under 12 year.

8. Dependent care includes care of children, older parents and handicapped dependents.

9. Based on Friedman D., Family supportive Policies. New York: The conference board, 1987 and Hootsman H. e.o., Dual career partnership: nice or nasty? VVAO 1987

Views of Women Managers working in the U.K. petroleum industry.

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Leeds Metropolitan University, U.K. *

Studies of women performing management roles at work describe disparities in the number of men and women achieving managerial positions. If organisations do begin to exhibit a more flexible culture it has been suggested that more women would gain access to senior management posts. Other factors regarding interpersonal behaviour may, however, act to prohibit this development. Where women are working in isolated positions, with male junior, peers and senior staff, any issues of an interpersonal nature due to gender would be expected to be marked. The petroleum industry was selected for a qualitative study to research this question. Discussion of the views of a sample of women, working in management, of their own management styles and their perceptions of colleagues expectations and behaviour will be provided.

The labour market, in 1992, remains differentiated hierarchically and horizontally on gender grounds. Although economic activity is clearly an important feature of U.K. women's lives, with 75% of single and 70% of married women aged between 16 and 59 years engaged in paid work (Social Trends 1991), only 7.2% of women employees as opposed to 14:1% of men are employed in managerial jobs. When examining managerial posts further, whilst 27% of managers are female few (4%) of these are engaged at senior or middle levels and a very small fraction are engaged (1%) in top positions (NEDO, 1990). Many factors are relevant in an analysis of this situation: notions and values of skill and the gendering of skill and status; associating leadership with 'male' qualities (Cockburn, 1985; Burrington 1987); organisation cultures that reflect and meet the purported needs of men (Stead 1985); and the division of domestic labour (Barrett 1990). Greater informality has been seen developing in certain organisations (Handy 1985; Wragg 1991) making them more 'flexible'. These have been heralded as changes in organisation culture which are likely to benefit women (BCS 1990). Alternatively, however, interpersonal work relations may become more significant in determining the balance of gender power in the workplace and work as a barrier to these changes. This study examines the views of women managers recording their views and experiences of interpersonal work relations with the manager's peers, her own manager and subordinates.

The Study

The research was undertaken with managers working in the petroleum industry since women form a small number of the employees in the industry and are likely to work with male junior, peers and senior staff. It was undertaken through individual interviews based on a relatively unstructured interview format. Each interview covered the same areas but the interviewer did not restrict discussion, finding that coverage of these naturally varied from one interviewee to another. The interview approach adopted was non-directive; each session was taped and scribed later. The work focussed upon obtaining qualititative information in order to identify themes, patterns and areas of common experience. The study included discussion with 12 women managers undertaking a range of technical or project management work; the women ranged in age from mid 30s to late 40s and senior to junior level management jobs. The following section summarises the themes identified from the individual taped interviews undertaken in 1991. Any direct quotations used from the interviews are presented in *italics*.

Results

A. Interpersonal work relations - Peers

All the women interviewed took part with regular meetings with peers. The themes evolving from this section concentrated on experiences of meetings. Power balance issues were particularly evident in team and group situations. Although the aim of meetings was agreed ostensibly to be team-work, the general tenor of meetings was frequently *'emotionally charged'* with *'people round the table all vying for position'* where male colleagues were particularly *'competitive and aggressive'* with group members attempting to score points regardless of the relevance of the issues under discussion. With regard specifically to gender relations:

1. Meetings were dominated by men often, *'bulldozing their way by talking over women'* colleagues and treating them differently, or *'more like secretaries'*, asking or expecting them to undertake work not part of their roles. Women were less likely to be acknowledged or listened to at meetings, being *'edged out of conversations'* recognising that they felt treated as more light-weight and taken less seriously. Men made it clear that they saw certain women as aggressive and that their interpretation of behaviour was immutable, predicated on expectations of behaviour, different and appropriate to each gender. Work itself was seen as based on *'male values'* and women's assertive behaviour was being misinterpreted; women moving into management had *'done so at the expense of being a woman'*.

2. To be accepted by male peers, the women circumscribed their behaviour, consciously avoiding confrontational approaches, ensuring that they did not threaten or undermine men's power, particularly in meetings.

Alongside this came a perceived need for the women to ensure their professional role was pre-dominant. The importance of blending in and conforming to standard dress codes was stressed, though women *'needed to be a lot more spot on, appearance wise'*, and looking *'exceptional could have a bad effect, women are definitely judged on their appearance'*.

3. Behaviour exhibited by men, *'bordering on harassment'* was viewed as common experience and generally companies mechanisms for these cases were not seen as encouraging or supporting of the 'victim' concerned. The U.K.'s Industrial Tribunal system was regarded as *'so abhorrent that some women will not go through with cases due to this'*.

4. Conveyance of personal competence in females was felt to be required over and above requirements for their male colleagues. The need still to be *'conscious of the job you are doing and to make sure that you are doing it really well'* was clear. Highlighting women in management roles and activity drew with it the penalty for any mistakes made; these were more highly visible and *'rated worse than if a male made the same mistake'*. Once technical competence was proven the agenda still seemed set differently for men and women : work in a male culture that for example gave rise to 'cliques' that women had difficulty in joining.

Different treatment and behaviour of female colleagues by males was pervasive but problematic *'I know that it's there and that it is underground, but it's more difficult to come up with examples'*, which of course makes it impossible to remedy. Gender power relations were less apparent to the interviewees in one-to-one situations with male colleagues.

B. Interpersonal work relations - Interviewee's Managers

Akin possibly to all staff, relationships with the women's own managers were perceived to be very individual relationships and highly dependent on the people concerned, making identification of themes more difficult. These relationships were spoken of in more positive terms than those with peers. Significantly, managers had offered support and encouragement, fulfilling expectations regarding males playing mentor roles thereby occupying the more senior or leading role in the relationships. The following presents specific gender relation themes which emerged :

1. Ensuring that the encouragment of women staff was entirely beneficial, according women the same opportunities to gain skills to access the posts with greatest power in the organisation, was needed. Even with supportive bosses *'it is still a disadvantage if you are very ambitious because discrimination is still there'* and further recognition of skill or success by the manager was felt to be less fulsome than if the same had been achieved by a man.

2. Generally open and friendly relationships existed with managers (all male), with a great deal of freedom for the women within their work. Greater difficulty socialising with male managers was clear as the manager *'found it a lot easier to socialise and gossip with his male staff than with me'*, working with a woman colleague was said to make him feel uncomfortable.

The issue of the difference between a man's or a woman's informal relationship with their boss may be significant in terms of career development. Informal socialising provides a channel for staff to discuss ambitions and aspirations, indicating also the importance of networking. Men were indicated as making more extensive use of social events and networks, even when socialising was deemed to be a significant part of the job undertaken. This was felt primarily to be due to the limitations placed on female staff by family responsibilities, making devotion of sufficient time and energy to work so to remain successful in careers extremely difficult. Social roles were thus seen as circumscribing work activities, ensuring that while her male colleagues were down the pub, she would be at home *'changing nappies'*. None of the companies where the women worked offered childcare provision and few made arrangements for career breaks. The networks known to the women operated in very informal ways, making them harder to challenge. Alternative networks for women specifically were not thought to be advisable however because they would identify the women as special, working to limit the scope of discussion to *'items of concern to women only'*.

C. Interpersonal work relations - Managing subordinates

Gender power issues were particularly prominent in this area, the themes which emerged were as follows:

1. The management styles used by the women with their staff were stated as consensus, rather than authoritative or directing and less hierarchical in balance between the female manager and male subordinate than male manager and subordinate. They were attempting, in statement at least, to support subordinates in making their own decisions, *'if you can lead (them) on and get them to think and become more independent then they actually become more useful'* workers. This emphasises discussion and seeking agreement as important aspects of management style; *'women try to lead the team on rather than giving a command'*, *'treating people as they would wish to be*

treated', using a *'co-operative and friendly approach'*.

2. Potential vulnerability in asserting authority was commonplace : *'unnecessary battles'* were avoided but speed was often needed to prevent *'people trying to avoid me and go straight to my senior because he is a man'*.

The women's adoption of less confrontational management styles was not viewed as altering the balance of power with male subordinates, though the affect of taking more typically male approaches to staff was seen as attempting to alter the gender power balance, a strategy doomed to failure.

Discussion

Anyone wanting to challenge management views and organisation practice must take into account the flexibility required by companies for overseas postings and the importance placed on the needs of technical workers being met, especially where there was seen to be a shortage of technical labour. At the time of this study the economic state of the industry was not buoyant but also not at its lowest ebb. These matters clearly compound the problems in seeking change. The findings concerning the future may not be so pessimistic, because most women in the study indicated that their organisations were moving towards a more flexible and caring management style. This may promote skills which find affinity with the statements made by women regarding their own management approaches and style but may herald two problems:

1. This approach may be seen as important in jobs which involve direct staff supervision, presenting managers in a less hierarchical way leading to women facing difficulties in male perception of their strengths and

assets.

2. Jobs may become associated with gender once more, leaving those jobs involving strategy and resource planning, with less staff supervision, to males and lead eventually to a deskilling thesis for staff intensive, 'female identified' roles in management.

The study has shown that individual women may achieve success but within the petroleum industry they still perceive difficulties and inequalities in achieving this merited success. If the number of women reaching senior positions is to match that of men, organisations need to become more aware of their own culture, reflecting on and seeking to change their values and practices, actively engaging in the issues of gender power in interpersonal work relations. Feelings of isolation have been identified: the question as to whether networks are important in helping women to deal with gender power problems being experienced and assist in increasing women's self-worth and value in an organisation, requires further exploration.

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WOMEN'S STATUS IN THE UKRAINE: EMPLOYMENT, TRAINING, EDUCATION, CAREER DEVELOPMENT

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More than 10 million women in the Ukraine are engaged in some form of economic activity. They account for 52% of the labor force. At the same time in the new conditions of entry to the free market women make up almost 80% of the unemployed. Women's qualification level remained lower than man's despite the fact that women account for 61,6% among specialists with higher and special secondary education. Across industry, 4 times as many women as men were found in the low skill category of employment and only 3.6% of women had undergone special training to improve their qualifications. For many women, however, increased qualification did not lead to promotion at work.

In July 1991 was declared the independence of the Ukraine. This act opened the new possibilities beforethe Ukrainian women. The move from dictatorship to equality within European community, the new conditions of political independence and formal recognition by other countries, the entry to the free market economy make women to find new solutions of their problems.

How do we see ourselves under these new conditions? How can we became integrated within the European market with our crisis-ridden economic and cultural background? First of all let us look at the current situation on the labor market.

With reference of official statistics, trade union information and sociological research from 1980-1992, the evolution of women's status and the changes that had occurred as a result of the economic reforms could be observed. Analysis of such information, shows that women had been broadly integrated into the process of economic development but that integration was irregular, according to the health of the economy. Of the 27.7 million women in the Ukraine in 1991, 10.6 million of them were engaged in some form of economic activity. Women still accounted for 52% of the labor force and that had remained stable over the past decades despite a slight drop in their share of the population. Women's participation in the labor force has gradually and inexorably increased, largely due to social and economic necessity. For women their participation in the labor force was necessary as the major source of income for them and their families or as a second income, equally necessary for survival. At the same time in the conditions of economic crisis women's labor force position was less favourable than man's at such times and extra efforts were required to mitigate the disadvantages they suffered.

Employment

The level of economic development had a significant effect on the economic role and status of women. The sectoral and industrial structure of female employment had changed during past decade. As women are concentrated in the service sector they accounted for much of the increase in this sector. Women accounted for 85% of persons employed in trade and public catering; 80% in health and social security; 75% in education and 72% in culture and art. Women's employment was concentrated in a number of non-farm branches of industry. Women accounted for over 45% of persons employment in manufacturing, almost 30% in the building industry and in textiles, mechanical engineering, instrument making and radio industry women accounted for more than 70% of employees.

Women's share of employment in the agricultural sector, although decreasing, remained high and it was expected that women's employment in the developing private sector would increase. The employment of women in some traditionally male spheres or jobs, such as engineers, agriculture and economists, had increased but women were still strongly underrepresented in senior administrative and managerial jobs and in most academic and scientific occupations. The labor market on the whole remained segregated along male and female jobs and was largely characterized by decreased horizontal occupational segregation but static vertical segregation. Women's employment was limited by traditional perceptions of women's roles but tended to be concentrated in industries and occupations with bad working conditions, night work, handwork and low levels of responsibility.

Education

The development of science and technology, changes in the structure of the economy on the way to the free market demand an increasing qualified labor force. The qualification of all workers should increase. Women's qualification level remained lower than men's despite the fact that the percentage of women among specialists with higher and special secondary education was 61.6%. Women make up 51% of the overall number of students at the higher scools of learning and 57% of students of the technical secondary schools. Annually Ukraine's vocational schools train 420-430 thousand skilled workers 30% of whom are women. Over 4 million women have higher secondary or technical education.

Education level of men and women in the Ukraine
Number of people having education per
1000 of population

	men		women	
	1979	1989	1979	1989
The entire population age 15 and older	1000	1000	1000	1000
Number of those who have education:				
higher	82	113	62	97
specialized secondary	110	165	119	192
general secondary	279	365	219	268
The entire employed population	1000	1000	1000	1000
Number of those who have education:				
higher	100	137	91	142
specialized secondary	133	196	174	278
general secondary	326	431	298	368

Training and retraining

However, despite educational advantages, improvement of qualifications was much more difficult for women than for men, as women largely have responsibility for children and the home in addition to their waged employment and consequently had no time for professional development. For example, across industry, 4 times as many women as men were found in the low skill category of employment and only 3.6% of women had undergone special training to improve their qualifications. For many women, however, increased qualifications did not lead to promotion at work. The opposite experience was true for men.

Prior to economic restructing, women's industrial employment was characterized by occupational segregation, feminization of industrial sectors and limited occupational and sectoral mobility for women. Through training and retraining programms the current transition period offers an opportunity to change these patterns. Specifically, women need to be guaranteed access to, and encouraged to participate in, all forms of training, including in-plant training programmes, vocational, apprenticeships and technical/managerial training schemes.

However, in practice, more than half of all women don't take advantage of government - sponsored training after their marriage. In 1991 only about 330 thousand women underwent re-training or mastered new trades.

The low level of women's qualification is one of the factors which affects theprofessional status of women and their earnings. The passiveness of women in question of upgrading their qualification is not only due to shortage of spare time and tiredness caused by physical and psychological overload. Women's professional status often remains invariable after they undergo retraining.

Number of women who underwent training, retraining and mastered second trade in various branches of economy

(thousand people)

	Number of women who underwent training, retraining and mastered second trades	
	1985	1989
Overall number	383.7	327.9
Including enterprises and organizations in:		
industry	252.8	211.0
agriculture	8.4	4.4
transport	14.0	11.1
communications	15.9	11.3
construction	29.8	15.1
Trade and public catering	19.1	34.6
Housing and municipal economy and non-productive consumer	22.3	22.1
Health care, physical training, social security	6.8	6.1
Public education	0.3	0.5
Culture and arts	0.9	0.6
Scientific servicing	2.0	1.3

The situation changed some years ago. In the conditions of real unemployment women consider, that training and retraining equip them to meet the demands and labor market competition of the market-driven economy. It is necessary to effectively integrate training into the overall package of unemployment services offered to women. Although the state employment service was being set up in Ukraine its activity is not effective. The government do not, at the moment, have funds available to provide extensive training.

In recent years we could see the following tendency: higher levels of unemployment were observed among younger women who just begin their work career and older women faced with early retirement. Now these groups of women workers need special attention because they become the first victims of unemployment.. So they need special training with built - in guarantees of employment and appropriate conditions in the new position.

Career development.

Difficulties associated with the professional training and qualification of women was exacerbated by the existence of a barrier to their vertical mobility. The level of involving women in managerial activities is low. According to official data the number of women who headed state enterprises was 309.7 thousand (of whom 74% were appointed and 26% were elected to the position). Most women departmental heads are concentrated in light industry, trade, the information sector. Even in "feminised" industries there are few women holding leading posts. Thus, in education and health care women accounted for between 16 and 28% of heads of branches. Some professions are virtually beyond women's reach (participation in higher levels of power, in international relations and in advanced fields of science and technology). The above mentioned peculiarities of women's employment are shown by the data on the share of women among researchers.

Number of women among employed in science
(thousand people)

Level of qualification	Number of women	
	1986	1988
Academicians	0.5	0.5
Doctor of science	0.8	0.8
Candidates of science	57.8	66.4
Total employed in science	79.1	83.9

And what about women's chances to become a leader in new conditions? Political and economic democratisation, the entry to the free market economy, equal partnership in the East-West dialoque gave new possibilities for women's career development. There is a need to recognize women's business qualities as heads of small and micro-scale businesses, both in urban and rural areas, and co-operatives. But special requalification courses are also required in this field. The 30 thousand currently functioning co-operative agencies now incorporate about 800 thousand people the majority of whom are women. Under the current conditions, when new forms of female employment are intoduced in Ukraine, of great interest seems to be the experience of other countries in the implementation of the development programs for small business, banking and credit relations. Specialized counselling services and training should be provided to enhance women's potential as entrepreneurs. In the Ukraine only first steps in this area have been made.

II REFLECTIONS ON GASAT WORK IN THE FIELD OF EMPLOYMENT

9 Work and family: having it all

WOMEN WANT BOTH: JOB AND FAMILY

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It is the result which I got out of the interviews I took with 28 couples, who expected their first child: The traditional gender-divided devision of labour between mother and father is not longer the arrangement people prefer. In reality, however, it appears very difficult to share responsibilities. Usually the fathers don't change their life in fact. They go on being busy in their jobs. The young mothers also would like to continue with their jobs after they finished the (legal) up-to-one-year-pregnancy-leave to a child. To be a housewife and a mother is no longer a role to satisfy. But normally the effects after the birth of a child are for the women much more aggravating than for their partners: They have to take leave at least for some time and then to go back to normally part time-jobs with low pay and bad working conditions and they are dependent on the income of their husbands. In most cases they have to drop their "carreer".

In this paper, I want to inform you about initial results of a research project, funded by the Deutsche Forschungsgemeinschaft (Notz 1989a and b).
First, I want to present the goal of this research and clarify the methodological approach, second I will emphasize some research results that illuminate the problems of combining both job and family responsibilities. It follows the presentation of wishes and visions formulated by the people questioned.

1. The goal of the research project

The research project covers the founding phase of 28 families over a time period of two years. It is attempted to identify the young parents' expectations of the family, based on their own biographies, and to analyze the impact of these expectations on their own strategies to combine the tasks of job, housework and the new tasks of childrearing.
Beyond this, data on the changes in real life conditions of young fathers and mothers, prompted by the birth of the first child, and the subjective evaluation of these changes were collected. Subsequently, these data were analyzed as

indicators for possible changes in the structure and function of the "nuclear family".
The men and women in this sample are between 22 and 49 years old, nearly all of them have a solid job qualification in different, mainly non-academic occupations. They live in different towns and rural areas, in flats, houses and communal households. The empirical research was conducted during three differnt time periods:

1. During the woman's pregnancy
2. When the child was between three and five months of age
3. One year after the child's birth.

The analysis of coping strategies developed by the couples, is at the heart of this research. With the birth of the first child, each couple is tasked with securing the existence of the new family in material and psychological terms. Both partners thus have to integrate their coping strategies on the basis of their own experiences and perspectives, foremost in the area of work (employment and housework/child-rearing). It was a question of particular interest whether the initially chosen coping strategies are maintained or given up, under which circumstances and with which consequences this happened and what kind of role was played by subjective forms of conflict resolution. Finally, I asked men and women how they evaluate and accept their new life conditions. This includes finding the limits and restrictions of the arrangement they wanted to carry out and making proposals for a future arrangement which would enable women and men to live with children and work at a job.

2. Methodology

In order to collect information on coping strategies of men and women, on their subjective view and interpretation of their life situation, research methodology had to allow for the minute recording of individual perceptions, judgements, opinions and descriptions. The participants should be in a position to clarify their own points of view, without being pressured into pre-defined research frameworks. Because of this open, problem-centered approach qualitative interviews were decided on. This type of approach required the ability on the part of both researchers and their interview partners to communicate openly. The result in this case will not be representative in the usual sense. The qualitative approach instead may yield a deeper vision of reality than research by questionaires, because it is possible to probe further into problem areas than with quantitative methods. For the interviews, structured guidelines with open-ended, but detailed questions were developed. They contained questions pertaining to the general life situation, the housing conditions, the family arrangements, the division of labor in employment and housework, the expectations regarding life with children and the coping strategies in this new situation. Fathers were included in the research, because I wanted to avoid feedback on their view of the paternal role solely from the women's perspective. I openly offered triggers for telling about subjective experiences, so that I could find the most complex approach to the life circumstances of these men and women. I was flexible in my response to the criticisms and answers of my interview partners, even if those were departing from the initial schedule of questions.

Extensive stenographic notes were the basis for recording the interviews. This procedure allowed recording the content of the interviews as well as non-verbal behavior or other aspects of the interview situation.

A very time-consuming and intensive work effort was required to analyze the interview material. For me, it was a central point to isolate the ambivalence and contradictions emanating from the wish to have children, the wish to participate in full employment and the difficulty for women to realize both. I also wanted to look for changes in this phase of family living that can be considered stepping stones to a reorganization of production and reproduction, in a way to imply the men as well in the dilemma of combining job and child rearing.

3. Some results

The traditional, gender-hierarchical division of labor is under attack from many angles and is considered alterable, but the specific hopes and expectations during the initial phase of parenthood are blocked by many barriers, which contradict the search for planned distribution of housework and childcare among partners. The consequences of childbirth are far more serious for the life planning of women than for men. All women are underprivileged as compared with men in their respective occupational fields, even if they are well qualified. It was the woman who left the job, either for a specific time period, or in terms of part-time work. Men reaped the benefits concerning the distribution of privileges on the job, but in the family, they picked the pleasant aspects as well; solely based on their gender. The responsibility for the family, ascribed to women based on their gender, leads to double oppression, even in young families, though this is not as visible as formerly. The structures perpetuating social inequality based on gender are long-lived. The postmodern propaganda supporting a multitude of lifestyles has a "modernizing effect" on gender-based inequality, at the expense of women, again! The employment of mothers is accepted, because they have rejected to be solely restricted to the kitchen. The new slogan is "flexible organization of employment" for women - at the loss of their independent, self-supporting work - to the benefit of men, who still enjoy women's reproductive services, but at the same time don't need to fear women's competition in the labour-market.

3.1 Life with children - intention and reality

Before the child was born, nearly all the men indicated their readiness to participate in childcare: "I want to be involved in child care and I want to learn about how to deal with a child", or: "I can envision to take over all chores at home. I wouldn't say I won't change the child's napkins, because I would feel disgusted, these things need to be learned and then I'll do it." What nearly all fathers did, was participating in the preparation for birth and being present during the birth of the child; with the exception of two, where the mothers were single parents. After the birth, there were visible restrictions: "She spends so much more time with the child than I do, because I have to work outside the home." The men don't see this as a problem. Thus, the father's direct involvement with the children is quite limited and concentrated on dimensions of play and taking strolls: "I am responsible for action." Care and services in child-rearing, the everyday routine of changing napkins remain the responsibility of the women. Few of the men harbor guilt feelings about their long absences: "It's okay, no, I don't have a bad conscience", or: "I have so many things to think about, I am relieved to have the brat around for only one to two hours." The waking time of the child is short, but fathers only rarely feel their deficit in communication with the child, the job dictates their time: "I am sorry, a teaching job would be better!"

3.2 Occupation and Child

When we took the first interviews 17 women and 16 men were fully-employed, four women had a part-time job, four women and two men were on temporary work, two men worked self-employed, one on civil defence, one woman and one man were completely without payed work. Only one woman never went to work outside the house.

For the women in our sample, being a housewife and mother was not a desirable position, because the social costs of embracing the maternal role, measured in terms of the loss in status and qualifications in the job-world were too high, in the long range.

"Housewife? No, I can't imagine... to remain at home forever, not doing anything, I don't believe this."

The men, who contemplate being a house-husband, didn't imply "doing nothing": "I would like that very much. I would rather stay at home, then I could work with the computer...". Initially, most women mentioned financial reasons for wanting employment. They wanted their own money: "I have difficulties to think about living in dependency." This fear of financial dependency mostly implies the fear of control by the partner and the feeling to loose the ability of planning one's own life.

During the second interview phase, other aspects of employment were emphasized: social communication, the potential for social relationships and the participation in working for collective goals. "During work hours, it is understood to meet with others over coffee, in an informal way" or, "Employment is an important feature in my life. I elected this job, because I feel good at it. I like it especially, because we work in a team that I like."

All mothers took at least part of their parental leave (Erziehungsurlaub). Nearly all of them mentioned that they appreciate the interruption of employment for several months, but almost always with the perspective of returning to the job.

It is easy to see that those women, who regarded their work as diversified and interesting, tended toward minimizing their leave from work. "I think, within half a year I will be glad to return to the job." Among other things, women have financial reasons as well as reasons of maintaining their old job, that prompt them to take less than one year of parental leave: "I wanted to keep my old job, that's why I return to the job earlier."

The less women experience personal recognition and satisfaction in their job, the stronger they support interruption of employment. The justification also allowed men to stay at home (at this time) for twelve months, if they had a baby. But they won't.

Only four of the men interviewed wanted to take part of the parental leave. The others had manyfold reasons, why they would not do so. Most anticipated difficulties on the job, currently as well as possibly later. These four fathers had plans how to personally use the time as "fathers only" for their own benefit: "I look forward to it. I want to continue my additional qualification" or: "I did a lot of drawing and photographing formerly... I have planned a lot for the next year." One wanted to convert the attic into some rooms. All of them did not succeed in doing the expected work during the time.

Childcare and the effort to combine both gainful employment and childrearing still rests mainly on mother's shoulders. In order to combine employment and living with children, most women interviewed are still prepared to work part-time and/or do contract work.

For women, this still implies retreat or, at least, partial retreat from the job market, it means less pay in conjunction with reduced economic decision - making power and a declining standard of living, financial problems and difficulties upon re-entry into a full time, year-round job.

The large majority of men interviewed, in contrast, get ready to assume a full position in the market place. Even the four men opting for a parental leave, did so only temporarily and moved back into their full time, year-round employment. Some fathers changed their attitude toward employment after the advent of the child. They accepted for example a heavier load on the job, in order to balance the women's financial losses by increasing their own productivity. The alimentation for parenting of 600,-- DM per month is not adequate by far. The German child-rearing-financial act is still based on the older model of "main income generator" who is male and whose wife can and wants to life on pocket money subsidy. When we took the last interview only six out of 28 women were fully employed. Ten women were not employed at all, one worked on her doctor-degree, only four out of eleven part-time working women were able to live on the sellery they got out of it, the others did "unsecured" work. 19 fathers had full-payed-jobs, four out of them said, that they worked more than eight hours a day, three worked part-time with enough earning to live on, two went on with their studies and two were without any payed work.

3.3 Housework

As far as answers go, all couples, who had been living together already before their child was born, had divided household chores more or less equitably.

The information concerning who did what types of chores, showed a lot of overlap regarding both partners' comments in the different interview phases. As partners were interviewed separately, men consistently asked whether their wives had described their participation in different areas of housework along the same lines as they themselves. This reflects problems as well as a heightened consciousness about the issue at hand.

As soon as the women took their parental leave, the division of labor in the household changed dramatically with nearly all couples, independent of their occupational background. Women now carried the bulk of the household chores, again. The theoretically based insight on the part of men was neutralized by practical blocking: "Earlier decisions are no longer valid", or "She is at home all day anyway!". Some of the women say: "He thinks, as long as I'm home, I should do this", or "I have time now, so I won't say, I'll leave half of the chores till the evening". Some women were ready to pledge "guilty" for this state of affaires: "Before we had the child, he did more, maybe, because I did less. Now I do more, maybe, because I'm home and I see everything and I put more pressure on myself."

Applicable for most couples was the finding of women having to coordinate and organize the bulk of reproduction work. They had to delegate what needs had to be done, which in itself may lead to new conflicts: "Often he complains about my ordering him around". Just one single couple divided all housework and childrearing chores, though even here, preferences were set for different chores.

Nearly all men did shopping, smaller repairs in the house, gardening, working on the car, taking the car to the workshop and doing their own paper-work. They retreated more and more from the household chores proper.

3.4 Childcare Arrangements

During the first interview phase, the women couldn't envision their infants under three years of age being taken care of in public childcare institutions. The majority of women wanted to take care of the children first at home and then organize private care (i.e., Tagesmutter etc.).

It is a major dilemma for parents that public childcare for infants and toddlers up to age three is almost non-existent in Western part of Germany. The dominant ideology demanding the care of small children in the family, which means the care of the mother.

In the second phase of interviewing I asked the parents their views on childcare in the family against a hypothetical availability of public childcare, acceptable in it's quality and quantity. I found, that the overwhelming majority of parents would favor social contacts of small children (pre-Kindergarten age) with other small children. Parents would be glad to accept public childcare, whenever available and at the same time open to assimilate parent's socialization concepts. In the last phase of interviewing only three of the parents were lucky enough to find a place in a creche. All the others had to cope with self-support services or private care if the mothers did not stay at home. In no case the father was negatively affected by the idealization of family care. As long as this is usual there won't be any political uproar in the area of childcare, similar to the situation in the public health system, where nursing is breaking down.

4. Wants and Dreams - Demands

In the first and third phase of interviewing I asked women and men, what they want out of their life with children and what their dreams are. In the second phase of interviewing I asked them to specify their social and political demands emanating from these wants and dreams. The evaluations of these "dreams" show very clearly: Women and men want to work four or six hours per day, but they want their livelihood guaranteed: "I want a parttime job that supports me" or: "Each partner should work for him/herself to be economically independent from the other," they consider "occupational balance to be favorable in living with children" and "I want to live my life without being constantly pressured by compromises". Based on the research, I can draw the conclusion, that the enormous difficulties mothers have to overcome in their effort to combine job and family tasks, lead to overwhelming pressures in terms of time, physical, emotional and psychological demands.

Alternative ideology needs a structural chance in working life and family. If women do not want to be economically and socially marginalized, they must find rules and instruments which allow their equal participation in the labour market; and they must have social facilities acceptable in its quality and quantity. Also, we need equal participation of men in reproduction work. Today neither the work-place in the production or administration-sector, nor the work-place within the household provides for such labour sharing. In order that each woman - as well as each man - is enabled to strive toward a sensible, self-determining and personaly-enriching work-activity we need a structural change in both work-fields: the family and outside employment.

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WOMEN'S EMPLOYMENT IN CREATION OF LABOUR MARKET IN CZECHOSLOVAKIA

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For a long time the situation and the problem of women's employment in our country were considered as research priorities. Attention was given to the area of women's labour problems, but no realistic description of the main characteristics of the women working conditions was not undertaken. In the previous socialist society the system of employment was not varied enough to be the effective system of "female" occupation.

The following paper analyses contemporary situation of women in Czechoslovakia in the framework of the global employment policy in both the previous socialist period and the present transitional one of political and economical reforms.

The contemporary trends of women's employment in transition to market in CSFR are compared with the strategies for improving the position of women in the European region in the 90-ies.

The survey shows that women in post-communist conditions are strongly oriented to work, they would like to continue working more frequently than their husbands wish. The value orientation of men and women towards female professional activities becomes contradictory.

The facts from various sides of women's lives in pre-November Czechoslovakia proved that the period of the construction of socialism had brought radical changes in their living onditions and their quality of life. It must be emphasized that these changes were socially acceptable (positive) as well as unambiguosly negative. This statement will not be probably modified by any deep reflection of the past fourty years that is still to be done.

Our research has proved that after the November 1989 revolution the situation of Czech and Slovak women has not improved, and the protection of women's interests is still at the periphery in the decision-making processes of governments as well as outside interests of women themselves.

In the post-communist society the inner logic of women's life strategies is based on their previous personal life experiences, closely connected with the economic and social duty to work,supported by legal means, in the previous system, and the economic inevitability to work, now.

The end of 80-ies found Czech and Slovak women in the situation, which can be briefly characterized through the following status and trends:

-full employment of women, i.e. there is no possibility for further increase of the share of employed women. This boundary has been reached alread at the end of 60-ies the more than 45 per cent women's share out of the whole number of the employees in our country was reached;

-employment was split into each cohort by age and in groups with the highest fertility the share of 83 to 93 per cent was reached;

-women were working on full load (it means 42 hours per week) and a lot of them in shift regimes;

-overstaffing with women in the so called women's professions reached so high a part that it was not any more necessitated by some features of women's work but rather it was a result of relations in salaries and/or low social position of some professions;

-qualification of women oscilated at two points: the number of high qualified women was increasing; the number of unqualified women was also very high including all accompanying issues: personnel turnover, straining work, shift cycle of work, absence of rationality for work cycles, high morbidity of women etc;

-waste of intelectual and physical potential of women's labour (men's also) came to strategies of life that all labour categories were demotivated; the system of employment which was not effectively oriented secured social certainty but did not bring the dimension of rationality into life at the level of nation-wide consequences.

Basic norms of Marxism which reflected women's employment as a base of the real equality of women were in the socialist society forced upon women through the ideological machinery. Nowadays it is very questionable to regard women's economical activity only as an unlucky heritage of the age of the communist regime (Heitlinger).If we made an attempt after a short time, say three years, to evaluate what changes did well and mainly to estimate social risk for further development we have to concentrate on those new objectives which are connected with the liquidation of artificial employment of the past regime. This employment is now, during the economic transformation phase, changing into open unemployment.

In the economic domain of the post-communist societies the exclusion of women from the labour market is anticipated. This tendency has not come out to a more significant extent in our country up to now , despite the fact that women's share in a substantial increase of unemployment in the Slovak Republic represents approx. 50 per cent. While the number of employed women represented over 41 per cent out of the total economic activity of population, registered women's unemployment share balanced between 30-56 per cent. (SR) This figure, however, is connected more with the liquidation of their workplaces as such than with any policy of their active economic marginalization. Beside strong regional differencies, the fact which caused the difference is mainly health, capability, experience, unemployment of school-leavers as a specific issue of increasing unemployment kohorta; lack of qualification,too. The data also show increases in the fields, most overstaffed with women (educational system, healthservice, financial services).

The state policy of women's employment, however, should not remain a utopian idea of "socialists" but a chance made by the state to women. This should allow them to decide individually on acquisition or loss of their economic autonomy. Female researchers from western democratic countries consider real tendencies of a shift from the public to private patriarchate and from the dependence on the state to the dependence on the husband.Common trends under current circumstances remain yet controversial and their incidental visibilisation cannot be considered fully unrealistic.

Feministic research in nordic countries addressed a warning to the women in Eastern Europe in form of a question whether or not they should be even forced to ask for a state intervention in order to eliminate the severe impacts of the market on their economic situation. (Dahlerup) Many researches have confirmed women's professional ambitions as the persistent living orientation. To keep and conntinue in professional career and work on full-time are the main priorities for 44 per cent women inquired in May, 1992. (1) This concept of full employment, based on full-time continuous work schedules throughout working life is considered in industrialized economics as unreal aspiration (Drew), but in our country it represents the most aspired model. (1)

Various forms of "work sharing" are still unusual. In our research the option to take part-time employment was chosen only by 16 per cent of respondents. The creation of part-time opportunities was owned as a positive pattern of employment for female labour in the EC countries, and the expansion of part-time working has been accompained by a growth of women in the labour force in the last decade. In the post-communist countries the state policies should utilise contrary trends to those in the EC countries,and through the state intervention in favour of a part-time working should try to overcome the following two problems - the high employment of women working on full load on the one side, and the unemployment rate which is increasing for both women and men on the other side.

The rise of part-time working in the Eastern Europe wouldn't bring increasing level of the female participation in the labour force as it was seen in Western Europe in the 80-ies, but opposite results would follow.

Our situation is complicated by two identified contrary trends - high level of female interests to continue in working and the absence of adequate state intervention in promoting women's employment according to the real social climate in the field of maternal employment.

There is as a new fact in our country featured women's inferiorization, exclusion as decission makers.In the socialist regime through a latent labour division the part of high qualified women was not adequately used, and did not find the place in the working positions hierarchy. The transformation phase which might open equal chances for those who are interested in overcoming the bariers has brought the evident paradox, women are subordinated more stronly than before.

The visible efforts to create a male dominated society can be identified in everyday experiences. The gender dichotomy is promoted not only in the world of work (Walby). The family policy deetatization with the consequences of finishing of the state subventions to the women-mothers through the state benefit in the sphere of social children services (the nurseries, kindergartens, youth-centres) is directed to the support of male-dominated picture of our new society.

Some positive aspects of this new situation are expected because the world of men's labour and women's labour became so close, that it was not possible to correct the visible dehumanization consequences which were against the women's interest, interest of children, family or against the whole dynamism of society; increased orientation of women on self-assertion in the sphere of labour caused gradualy decrease of their responsibility for the authentic maternity and parenthood; the same can be said about fathers.

The gender dichotomy which divides the work and positions according to feminity and masculinity (Munk-Madsen) was under socialist conditions directively temporarily removed. The ideological basis of work organization was abolished, and the dimension of rationality has to appear in the strategies of life.

The results of these changes are expected not only de-iure, but also de-facto. In order to adopt documents of the Committee on the Elimination of all forms of Discrimination against Women it must be considered that these documents are unknown to the majority of women in the post-communist countries.It is the responsibility of the mass media and women's organizations to produce the information programmes designed mainly to inform women about their civil, political, employment and social security right, as it was stressed and underlined in the conclusions and recommendations from the Athens European Conference in 1991. (Athens)

Women in CSFR note all antidemocratic manifestations not only in the world of work.Our research confirmed that although they are pushed from the created labour market, they feel equal to men, they don't want to retreat their work places for men. The variant to keep women's working places by lovering value of women's working force our women dislike too. (1)

There is no doubt about the existence of high competition in the labour market. Women are entering this market with confidence, high level of education and qualification standing in the background. If women want to make themself valuable it will be necessary to overcome the bariers in the public opinion and/or in the opinion of specialists in the women's labour "quality", following from underestimation of women.

Monitoring of the situation shows that the majority of our women have not prepared stategies of the individual economic rationality, how to touch new reality in policy of the unemployment, and they have any solutions in the case when they loss a job. Self-confidence for the private entrepreneur, and courage to start again has only a few of them.Data concerning persons providing individual activities shows that share of women in these activities is 19 per cent. (SR) In the beginning of the year 1990 inquired women were not interested in their qualification growth, self-education and their professional prestige rise on the labour market. According to the results of the research from March 1992 we can state that young women are different from the other women, and ready for further professional preparation, requalification. (Zeny, Maturanti)

To be good at and comprehend comlexities of work dimensions is a precondition for the succesful solution of one's own economical problems and acquisition of the economical autonomy.(Pronk)

Women's strategy concerning getting "family income" e.g. increase men's incomes and/or decrease their duty rates, is supported only by a one quarter of our citizens (1). But we can not wonder very much because the living standard of the family was guaranteed by the two salaries family budget; with this fact calculated both state, in the field of social policy, as well as women - mothers.

A lot of surveys confirmed the existence a big difference between opinion of men and women concerning the need of high employment of women.The women wanted to stay in required living standard, economic independence, qualification as well as run away from the solitude of prefabricated blocks of their flats - they wanted only better conditions. Men wished the situation in which their wifes would stay at home and would be good satisfied houskeepers, wifes and "mums".In this case the enemy would become, instead of the state, of the men, or even their own husbands who deem almost two times more often when compared with the women any more marked commitment of women in their jobs undesirable. (VM)

As a matter of course the individual "preparedness" of a woman enters this decision making process on the professional career of women in many diversified ways combined (confronted) with opportunities for their practical engagement which are limited by reasons on the part of the economic domain and the family situation of the women as well. Confrontation-oriented trend of evolution of the post-communist societies, as compared with the other Western-European countries, manifests itself in probably the most striking way.

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SOURCES of the DATA:
1 =Obcania SR v r.1992. Unpublished data from sociological surveys of Institute of Sociology of SASc., Bratislava

SR=Statisticka rocenka Slovenska.1991. Slovak Statistical Office. Bratislava

VM=Unpublished results of survey No.3/1991.UVMV, Bratislava

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THE LIMITATIONS TO THE SUPPORT FOR WORKING MOTHERS AND CARING FATHERS

Attitudes and informal rules with regard to employees with young children in two Dutch shopping-firms.

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Els Veenis is doing research into the position of working parents in two Dutch shopping-firms and is preparing a thesis. Anja van den Einden is as a student involved in this research.

Summary

In this paper we describe the support for working mothers and caring fathers in two Dutch shopping-firms, both in theory and in practice.
In the book-shops we investigated, the support-in-theory for working parents is rather large. In practice, there is a lot of goodwill and tolerance for working parents, but especially the mothers are stuck in the low-paid jobs, a situation that is taken for granted. In the supermarkets we investigated, the support-in-theory with working parents is smaller. In practice, working mothers and caring fathers are a big exception and do not meet much tolerance, neither from their managers, nor from their colleagues. With a bit exaggeration one might say: "They should be seen, but not be heard".

1. Introduction

"Men and women both combining work and childcare". Nowadays, this seems to be an appealing ideal to many Dutch parents. The number of female employees with children is growing and some companies do open facilities for working parents, such as childcare, parental leave and flexible working-hours. At the other hand, many Dutch women still (temporarily) leave the labour-market when they become a mother, while most fathers keep on working full-time. Whén mothers keep on participating in paid labour, they often work part-time. In the majority of two parent-families the woman does most of the housekeeping and childcare. Dutch women still seem to be stuck in the vicious circle being more responsible for the caring work at home and consequently they are working in the secondary segment of the labourmarket, which in fact, for its part, promotes a traditional task-division of work and care between the sexes.[1]

One can look for explanations for this gap between the egalitarian ideal and the more traditional practice on the macro-level of structures in society or on the micro-level of persons and families. But what about the meso-level of corporations? Especially in the Netherlands, corporations only slowly adjust to the desires of (a part of) their employees. Some social scientists relate this to their corporate cultures, the norms and unwritten rules for behaviour at work. In theory many employers and employees do support a more equal task-division between men and women, but in daily practice at work they still think in terms of the situation of a male worker with a housewife and a female worker who gives priority to caring tasks at home.[2]

In this paper we follow this cultural point-of-view and focus on the support for working parents in two Dutch shopping-firms. What are the limitations to this support? Do they differ for mothers and for fathers?

2. Methodology

In order to answer these questions we made a comparative case-study of two corporations in the profit-sector: a big chain of supermarkets (almost 39,000 employees) and a small group of bookshops (about 530 employees). We combined quantitative - and qualitative methods. The results of this research can not be generalised to other corporations, but will give more theoretical insight in the processes of gender-construction in companies.

In order to restrict the corporate culture to the norms and rules with regard to the combination of work and childcare, we designed a new concept: "parental culture". We make a difference between two levels. On the first level we look at the ideals and beliefs of the employees with regard to the division of work and care between men and women and the measures for the benefit of working parents the government or/and companies should (or should not) take. At the second level we look at the informal rules that regulate the ways the employees act and interact with each other.

With our definition of parental culture we refer to the so-called rule-theory of Harré & Secord (1979). A corporation can be seen as a cultural system, constructed by formal and informal rules of behaviour. Many rules with regard to the combination of work and childcare will be unwritten and even partly unconscious to the ones who live by them. Often, their existence only becomes manifest when they are broken. At that moment the support-in-practice for employees who combine paid work and childcare becomes visible.

3. The support-in-theory

In a postal questionnaire 2 x 265 employees from the two firms were asked their opinion about several statements with respect to the combination of work and parenthood and about "parental policy", measures on behalf of working parents.[3]

In the shopping-firms we investigated, the employees - similar to other Dutch citizens in public opinion polls- show rather egalitarian attitudes, but there is a difference between the two corporations. In the bookshops the majority of the employees subscribe the idea that men and women should share work and care, in the supermarkets the employees are more ambiguous. When we look at the opinions about the responsibility for parental policy, we see that the support decreases. In both companies 70% thinks parental policy is either a governmental - or a corporational task or a shared responsibility.

For a more detailed view on the support-in-theory we combined this information. In this way we constructed four types of respondents, in order of amount of support: supporters, ambiguous supporters, ambiguous opponents and opponents. The supporters are the respondents who subscribe the idea that fathers and mothers both should be able to combine work and childcare and who are also in favour of parental policy. Their support for parental policy seems to be rooted in their opinion about work, gender and care. Their counterparts are the opponents: the ones who are ambiguous about the egalitarian model or who think the father should be the breadwinner and the mother the caretaker, and who are not in favour of parental policy. Just like the supporters, their attitude seems to be rooted in their opinion about work, gender and care. Between the supporters and the opponents we see two different groups: the ambiguous supporters, who do not subscribe the egalitarian model but who are in favour of parental policy, and the ambiguous opponents, who subscribe the egalitarian model, but who are not in favour of parental policy. The ambiguous supporters do not seem to desire parental policy for themselves, but for other employees. The ambiguous opponents seem to think an equal task division is the responsibility for parents themselves.

Based on this classification of support we can draw the conclusion that in the bookshops there is a large support-in-theory for working mothers and caring fathers; in the supermarkets this support is smaller, because the supporters are more ambiguous and there are more opponents.

In both firms, the female employees are more supportive than the males. Besides gender, there are some other factors connected with the amount of support. Educational level and age are important factors: the higher educated the employees are, the more they support parental policy; young employees without children or with young children are most supportive as well.[4]

SUPPORT-IN-THEORY	Bookshops			Supermarkets		
	m	f	tot	m	f	tot
Supporters	54%	74%	66%	37%	45%	41%
Ambiguous supporters	10%	7%	9%	27%	29%	28%
Ambiguous opponents	15%	16%	15%	11%	10%	11%
Opponents	21%	3%	11%	25%	16%	20%
TOTAL %	100%	100%	101%	100%	100%	100%
N	109	152*	261	118	143*	261

* 4 women from the bookshops and 7 women from the supermarkets did not answer the questions involved.

4. Support-in practice

While the attitudes of employees can be rather idealistic, the (partly unconscious) rules that run in the company are more related to their own life at home and at work. They can be deduced from the actual behaviour of the employees. We analysed 15 personal interviews with employees with children younger than 13 years of age: male and female employees from the bookshops and supermarkets with different attitudes and practices. How do they react when their colleagues make use of facilities such as parental leave? And what do working parents consider as their rights, their duties and responsibilities? To reconstruct the informal rules, we located patterns of actions and reactions and the legitimations the respondents pronounce for his or her behaviour, and translated these "episodes" into rules. Based on the points-of-view from the different respondents we could make a profile of the parental culture of both companies.

4.1 The attitudes of colleagues

In both companies the employees are not surprised when a mother keeps on working when she becomes a mother, but it is a matter of course that she reduces her work outdoors to a part-time job while her partner keeps on working full-time. In the book-shops, when a woman with young children has a full-time job, she meets well-meant concern: her colleagues are rather astonished and ask themselves how long can she cope, her floor-manager regularly asks her how she is doing. In the supermarkets, when she is a single mother and has to work full-time, a mother meets compassion from her colleagues. But when she has a partner, her colleagues are more indifferent: as long as she does not cause trouble for her colleagues, they think it is all-right she combines work and childcare, but when she "takes her problems to work", they think she should reduce or quit her job or should find better arrangements for childcare. One female respondent from the supermarkets complains about the lack of interest from her floor-manager when she got a baby.

In the book-shops there is a growing number of men who want to be involved with childcare and who reduce their work outdoors. Most of their colleagues think childcare is a legitimate reason for men as well as for women to do so: "in principle, it should be possible". The female employees are often enthusiastic when a male colleague is a caring father. In the supermarkets there are very few men who work part-time in order to take care of their children. One respondent mentions a man, who works Saturdays and who takes care of his children "because his wife has a better-paid job". Most of the men with children have a housewife; men with a working partner are exceptions, and their situation at work is slightly differs from the other male workers: it is a matter of course that they work full-time at regular times and try to make a career, for example by taking courses and working overtime. But some of these men seem to realise that they can do so "because they have a wife who does not have a desire to make a career herself" and "who just loves to be at home with the baby".

Especially in the supermarkets many employees are still very young and do not have children yet. In the book-shops the majority of them, both men and women want to combine work and childcare. In the supermarkets many young employees have a view about the future in which the man works outdoors and the woman stays home with the children. This attitude seems to be changing, though: while in the past many employees opposed the idea of a working mother, nowadays a woman who wants to quit her job when she gets a baby, has to explain her choice to her colleagues. She "does not like her work that much" or says "it is alright to keep on working and to share tasks at home, but not with my husband!"

In the book-shops, the employees do not talk much about parenthood. It is considered a rather private issue one talks about with friends. The employees with children sometimes talk about them, funny anecdotes or small educational problems, but they do not talk much about the way they combine work and care. But when they make use of special measures, such as taking a day off because a child is sick, they do explain their situation to their colleagues. In the supermarkets most employees act in the same way as the employees in the book-shops, but some respondents do mention some conversations about work and care. In one shop with a "baby-boom", a group of young mothers all returned (part-time) to their jobs and they talk a lot about their babies and about the combination of work and care. One man mentions conversations among male workers about parental leave: some of them are considering the possibility to make use of this measure.

In both companies, the employees seem to be rather careful not to offend one another about the subject of the combination of work and care. There are no discussions about someones opinion about childcare, working mothers or caring fathers. The way one divides tasks at home is regarded as a private matter, as one's own choice that has to be respected. However, some jokes are made to working parents, such as "do you have to go home again", and "going home and sit in the sun, hey?"

4.2 Attitudes of the management

There is a growing number of working parents who want to reduce their work, want to stay at home when their child gets sick, want flexible working-hours or want to make use of the regulation that parents have the first choice for holidays. In both companies, the way in which these things are handled, differ from shop-to-shop. In most book-shops the floor-managers are quite cooperative, in the supermarkets this is not the case.

In most of the book-shops the floor-managers seem to trust their employees not to misuse measures, for example not taking a day off on busy days. In return the workers can expect a flexible attitude from their managers. In other shops working parents have to get permission from the higher-management; these parents seem to be less able to make the arrangements they want. For example, a man is not permitted to work part-time after a period of parental leave.

Many respondents of the supermarkets are less positive about the attitude of their employer: they feel the flexibility only has to come from the side of the workers. Their managers have a tendency to say "no", without considering different possibilities. Part-time work for men in management-jobs is not allowed and parents are not allowed to stay at home when a child is sick. Often, there is no proper substitution of women who are on maternal-leave: colleagues are supposed to take over the work and to work overtime, so the support from colleagues for working parents is not voluntary.

In both companies the management-on-top of the corporation seems to be rather hesitant with regard to flexible working hours and part-timers. In shops, part-timers and flexible workers are needed, to work in shifts and to fill in gaps when other workers are sick, but the full-timers are the core of the company. The management strives for a proper balance between the number of full- and part-timers. It seems to be afraid to create precedents; when they allow full-time working parents to work part-time and on flexible hours, the fences are down. Especially when an employee has a job on management-level, they think it is difficult to find solutions. Most respondents are aware of these problems for the organisation, but they feel the management is not always trying very hard to create new ways to adapt to the situation of working mothers and caring fathers.

4.3 Support-in-practice from colleagues

In the book-shops, colleagues are rather flexible: when a parent suddenly has to stay home because of a sick child, they do not make a fuss and take over the work of their colleague. Because there are many part-timers the employees are accustomed to making arrangements between one-another, to work it out together and make shifts with days-off, etc. Therefore, working parents are no exceptions; the other employees "sometimes need some cooperation too". Working parents feel a bit guilty, though, because they know their colleagues meet with some trouble, but put up with it without complaining and do not take it ill on them. They try to reduce these problems for their colleagues: often, they have a tendency to work rather hard and "to leave their combination-problems at home".

Some colleagues react rather surprised when a man wants to work part-time, especially when he has a job on management-level, but there are cases known that the majority of the employees supported a male colleague in his conflict with the management. There is less support-in-practice, when formal arrangements such as childcare and the possibility for feeding babies is concerned. Especially in shops where there also is no much solidarity among the workers, the employees without young children think fathers and mothers have to solve this problem for themselves.

In the supermarkets there seems to be less flexibility and more prejudice against working mothers. Some colleagues for example are afraid that working mothers will often stay home when a child is sick. Their attitude is not negative, as long as parents do not cause problems at work. The working parents who have problems with the management to get proper arrangements do not feel supported by their colleagues: when you stand up for your rights, you "put your head in the lion's mouth".

5. Conclusions

In the bookshops the respondents experience a lot of goodwill from their colleagues and from the management of the company. Many employees of the bookshops seem to support the idea that having children brings certain responsibilities of care for parents -for mothers, but for fathers as well. The employees seem to be aware of the problems working parents have to face and they act quite tolerant and supportive. The last few years, working parents meet some collaboration from the corporation too (help with childcare, unpaid part-time parental leave), and most floor-managers are flexible in handling informal regulations such as flexible working-hours. There are not many parents who make use of the company's help with childcare yet, because they have made arrangements of their own.

The respondents of the supermarkets experience more opposition from their managers, while their colleagues are rather indifferent to their situation, although the support seems to be growing. The supermarkets have the same formal measures as the book-shops, but there are not many working parents that make use of them yet: the measures are not well known by the employees and the floor-managers.

The respondents from both companies feel the support of their colleagues and managers for their situation is rather superficial: when colleagues are not parents themselves, they do not know what it means to combine work and childcare. When their floor-manager does not have children, he or she is more tended to say "no" to proposals from working parents about adjusting working times etc. Especially in the supermarkets many floor-managers think "a contract is a contract, when you do not fit in, you can better look for another job".

Although the support for working parents seems to be growing, there are some limitations to this support:

working mothers and caring fathers have to give up their career and they have to show great commitment to their company, by "leaving their troubles at home". When an employee wants a job on management-level, he or she has to work at least 80% and flexible working hours are less permitted than in low-paid jobs. This situation is taken for granted, it is seen as a consequence of the "choice" these parents make. The result is that most women with young children give up their career and most fathers give up their intention to be more involved in childcare. The support of colleagues seems to be limited to a positive or indifferent attitude; they do not strive for better conditions in the corporation to combine work and care, both for men and for women.

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NOTES

1. Knijn & Verheijen, 1988; Dutch Department of Social Affairs and Labour, 1992.

2. a.o. Veldman & Wittink, 1991.

3. These statements were based on two opposite models of combining work and childcare, the complementary - and the egalitarian model. Each model was worked out in five statements: about the working-role of men and women, about the caring-role of men and women and about their task-division. The respondent had to score each statement on a 5-points-scale (1=totally disagrees with, 5=totally agrees with). The ten statements together form the measure for the amount of support for the egalitarian model. The statements about parental policy were differentiated to policy for the benefit of fathers and policy on the benefit of mothers.

4. The difference between men and women is significant; this is also the case for the relation between educational level and support. The relation between age and support is not an one-way one: for the males the relation is significant negative (how older, how less support), for the women the relation is (slightly) positive, but this is not significant.

III RESEARCH METHODOLOGY AND EVALUATION RESEARCH

10 Research methodology

WOMEN INTO CONSTRUCTION: Reflections on findings and recommendations of two recent evaluation exercises on experimental Insight courses for school students in Britain

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This paper develops discussions which the author has presented at previous GASAT conferences. In particular it addresses the question of appropriate evaluation methodology in the evaluation of Insight courses. The methodology, findings and analyses of evaluation exercises on two Insight courses undertaken in 1991 are critically reviewed. One course was all female and the other mixed sex with single sex teams. The circumstances leading to these courses being run and the context within which they were run by a British quasi-autonomous non-government organization (QUANGO) are explained and discussed.
The role of the independent researcher is discussed. Conclusions are drawn about the potential areas of contradiction that may occur in such intervention approaches. The potential difficulties which may arise in their evaluation are identified and discussed.

Previous contributions to GASAT5 and 6 (Gale 1989, Gale & Fellows 1991) have been concerned with the development of pilot Insight courses for the construction industry (note 1) for careers advisors and latterly the evaluation of experimental Insight courses for high achieving public school students (aged between 16 and 18 years) studying A level subjects. The experimental Insight course discussed in the GASAT6 paper was an all-female event. In the summer of 1991 a second experimental course was undertaken involving girls and boys in equal proportion. The boys and girls were kept in single sex groups. The recommendation to run these experimental courses arose from the critical evaluation of a pilot Insight course run for careers advisors in 1990 (Baker & Gale 1990). The recommendation was for there to be three experimental courses; an all female course, a mixed sex course and a male only course.

In 1991 the all female and the mixed sex (single sex teams) experimental courses were run, funded and directed by a

British QUANGO. I was commissioned to evaluate the courses. Interim and final reports were produced but I have since been told that these are not for public consumption. The evaluation criteria were:

1 To evaluate the courses as all-female and mixed sex courses respectively.
2 To evaluate the appreciation of construction by participants.
3 To evaluate the course programme, content and operation.

The courses were identical except for their locations. They were residential and of three days duration. Their content included exercises or management games lead by construction company training officers, a construction site visit and team sport sessions in the evenings. The role models used to lead the teams were provided by large British construction firms. Sixteen girls attended the all-female course, with ten girls and ten boys attending the mixed course.

The courses were evaluated independently using a pre and post course questionnaire together with direct observation during an evening and the final day of the courses. The questionnaires gathered biographical data on participants and attempted to measure their knowledge and image of the construction industry before and after the courses. Also data were gathered on how well the courses informed and provided insights for participants. Positive and negative aspects of the courses were sought as well as data on whether participants were more or less likely to seek to enter the construction industry following the course.

The evaluations were written up as an interim report (following the first course) and a final report following the second course. Their structures were similar, containing information about the courses, their participants and detailed descriptive statistics on the responses to questionnaires. These included bar chart presentations of Likert type scale image question responses as well as tabular formats for other questions relating to strength of satisfaction with insight and knowledge gained. Further, a fairly detailed direct observation section contained presentation, analysis and discussion on qualitative aspects of course operation and content.

Although the first report appeared to be well received the second report was less well received. The three main criticisms were that the reports were "too quantitative" and that the focus of the evaluation related too much to construction production management and did not encompass the broader built environment professions. Also, it was said that the courses were for insight only and therefore questions relating to whether the courses were informative or not were inappropriate. These important issues are discussed later. The evaluation of these courses raises some interesting insights into the efficacy and shortcomings of Insight courses run essentially by the construction industry for the benefit of that industry. These courses are run by the construction industry as the QUANGO concerned is funded and directed in large part by the industry. Further, industrial organizations provide all of the inputs regarding information, role models and course content. The industry could be said to benefit in a number of ways. It increases its likelihood of recruiting well qualified human resources. The participants are exposed first hand to the culture of the construction industry and perceptions of this culture are disseminated to participants, non-industry organizers of the Insight courses (careers advisors) and second hand through the participants to other schools students and teachers. The participants of these courses were required as part of their vocational education to write short critiques on their experiences. These proved useful in compiling the evaluations. These critiques were also used by the participants in disseminating their experiences when back in their schools. The construction industry benefits in a sense from improving its public relations image. It can be seen to be doing something about the gender imbalance in its workforce. It would be true to say that the participants benefited in that they gained a fairly realistic insight into the sort of occupational environment in which built environment professionals work. However, this is maybe a confusing one as will be discussed later.

I think that there are some important issues relating to the promotion and perpetuation of construction culture, arguments about job security and questions relating to the independent evaluation of Insight courses. These questions are discussed later.

Course evaluations

The following comments are drawn from the conclusions and recommendations of the evaluation reports.

Both courses appeared to work well as Insight courses and the all-female course appeared to work as an all-female course. The site visits were seen as informative with some criticisms concerning the lack of female role models. However, it is important to remember that site visits are unique because all sites differ. It is very difficult to design a site visit, the virtue being that the images are real.

Differences in the groups of boys compared with girls were clearly identified. The presence of males and females may have increased the intensity of some images held by female participants. Close examination of one of the team exercises shows marked differences in the behaviour between male and female teams given the same task. All teams comprised "thinkers" and "doers". Whilst the boys easily took on the roles of managers the girls seemed slightly embarrassed at taking on powerful roles. All teams assumed a natural manager. The girl's teams were very serious about their task and constantly reviewed progress and discussed points until they had the exact solution and were in absolute agreement. The teams kept very much to the rules. They were consistently concentrated on the task and did not exclude any member from the team even if their contribution was low. The boys appeared to be more decisive though not always making good decisions. Decisions were challenged by jokey criticism. One boy's team challenged the rules with the exercise organizer and even approached the other boy's team to do a deal. The exercise involved optimizing resources in order to achieve the production of a model building. At the end the boys were high spirited and confident whilst the girls were relatively subdued and self-critical. The boys compared their models with those of other teams, being amused by the girl's efforts. Another exercise was undertaken where cost was an important criterion for success in the design of modifications for a public place to meet the needs of people with disabilities. The boys were more cost orientated whilst the girl's teams concentrated on the needs of disabled people rather than costs. On the all-female course several participants said that if there had been boys in their teams there would have been a lot of argument. It was said that boys did not listen. Girl's teams appeared to act in a fairly harmonious and open way. A lot of reflective questions were used in the group process.

Females on the mixed course were, on the whole , more negative about the notion of all female groups or courses than their counterparts on the all-female course.

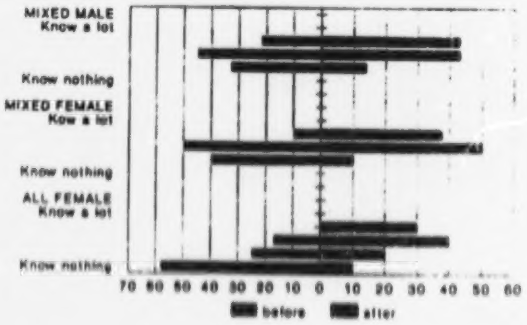
Participants on both courses appeared to show an improved view of the construction industry following the course (Table 1). The self perception of participant's knowledge of the construction industry improved following both courses (Table 2). Objective measures of knowledge appear less conclusive. This could be due to the inadequacy of the instrument used. However, the image of the construction industry appears to have been enhanced by the courses.

Table 1: Changes in view of the construction industry following the Insight courses

Responses to the question: Has your view of the construction industry, as a result of this seminar remained the same, changed for the better or changed for the worse?

	PERCENTAGES		
	All-female	Mixed	
		Female	Male
Remained the same	10	13	29
Changed for the better	90	75	71
Changed for the worse	0	12	0

Table 2: Perceived knowledge of the construction industry before and after the courses



Criticisms of the evaluations

Mentioned earlier were three criticisms of the evaluations. the first concerned the perception by the readers that the reports were "too quantitative". The use of descriptive statistics is essential and the easiest way to illustrate similarities and differences. They are an extension of qualitative categorization. Further, the use of bar charts to present Likert type scale results is a recognized convention and can not really be considered too quantitative. The reports carried considerable discursive sections. It would appear that the readership of such reports may not always really understand the nature of rigorous evaluation. Further, I think that sometimes the messages carried in such reports are not always welcome.

The criticism that the evaluations focused too strongly on construction production management is probably a fair one. However, there is a difficulty here in that it seems to me impossible to develop meaningful insight into a number of industrial subcultures at the same time. For example, there is a perceptible difference between the civil engineering and

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building subcultures. This is further complicated when considering the differences between design and production phases of the construction process. I have chosen these to illustrate my point because they are relatively close comparators. However, if one compares architecture with say quantity surveying (see note 2) then there is a much larger gap. the world views of these different occupationally based subcultures are different and in many ways antagonistic. This is grounded in their different educational structures and relative roles as well as historical determinants of status and hierarchy. In short, I think it very unlikely that an Insight course can effectively encompass more than one culture and at best two in a comparative sense.

The third criticism was concerned with the perception by the organizers of the Insight courses that information should not form a major part of the courses. The evaluation of questionnaire responses shows that many participants wanted more specific information. Their expectations were that this would be available. In my view the concept of insight is founded on imagery, understanding and objective fact or information. It seems a perfectly reasonable expectation for participants that information will be available in the detail necessary to support the development of their insight. There is a danger that by not providing a whole and very deep experience the insight gained will not be anchored in reality. It is probably appropriate at this point to say that industry both consciously and subconsciously will try to show its best side.

Conclusions

The methodology for evaluating the Insight courses seems on balance to be effective and appropriate. There are a number of questions however that appear to impact on the evaluation process. The first of these must be to do with who is considered to benefit from an Insight course; the participants, the providers, the industry or a combination of all or some of these. Further, what is the hierarchy of such benefit and how can it be measured.

The construction industry is actually more than one industry. It contains several definably different markets, house building compared with public sector civil engineering works for example. The size of firm as a structural feature of the industry is very important. In 1985 5.5% of firms produced 67.3% of construction output and employed 61% of all construction industry employees. In the same year only 39 firms had payrolls of over 1200 employees (Shutt, 1982). The different markets and the different size categories of firms have different subcultures. They share a common construction culture but the determinants of size and market have a significant impact on industrial practice and culture. add to this the occupational and professional differences previously mentioned and a complex picture emerges. This picture is important contextually. There does seem to me to be a common aspect to all of these variants of culture and that is that the construction industry is essentially male. The construction industry is demonstrably male in terms of horizontal sex segregation of the labour market. Women represented 6.7% of full-time workers in the British construction industry in 1981 (EOC,1988). My own estimate of vertical segregation based on 1981 Cencus data shows women to be heavily concentrated in the traditional secretarial and administrative occupations; 82.2% in 1981 (Gale,1991and Rainbird,1989). In one of the chartered institutions relating to construction production management professionals; the Chartered Institute of Building (CIOB) only 40 out of 8452 corporate members were women in 1992 and 594 women out of a total membership (in all grades) of 32569; less than 2% women (CIOB,1992). This is after a dramatic recent increase in female members.

Not only is the workforce male but the prevailing ethos and culture are also extremely male, characterised by comments like the one below taken from the questionnaire response of a young trainee construction management student:

> "I don't really understand why women want to work in a traditionally male industry - compare with nursing. I don't have anything against women)." (sic)

The construction industry culture is in need of change if it is to escape from its current characteristics of crisis, conflict and masculinity. Insight courses put this culture on show in some way. Those, both male and female who wish to join such a culture will do so and it could be argued, no doubt, that Insight courses and other intervention initiatives give insight and information upon which young people make career and educational choices. It seems to me that implicit in Insight approaches may almost invariably be the statement that women must fit in to the dominant culture. More women in the industry does not therefore mean that things will change for the better because it is not the presence of women themselves that necessarily equates with female values or of different values to the dominant male culture. I have discussed this question in much more depth in another recent paper (Gale,1992).

In summary I would hypothesise that we are not sure what we are doing when we run Insight courses. Further, I think that the role of the evaluator can not be independent of the world view and theoretical construct within which that person or people conceptualise and interpret. The very nature and purpose of change should perhaps come under scrutiny.

Notes

1 Insight courses were conceived by the British Engineering Industry Training Board in 1979. They were one week long residential summer schools attracting high achieving female school students. Key features were industrial visits and female role model group leaders. More details on the structure and evaluation of these courses can be obtained from EITB publications (Peacock & Eaton, 1987, Peacock& Shinkins, 1983, Viscardi, 1987).

2 The term quantity surveying may not be readily understood by an international readership. The nearest American equivalent is cost engineering. The occupation of quantity surveying is concerned with the economics of the construction process, normally at project level. Further, the role of a quantity surveyor involves usually some legal contractual work associated with the management of construction projects. Typically a quantity surveyor's education and knowledge base includes a deep understanding of construction technology.

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THE ROLE OF THE FAMILY IN THE LIFE THE MUSLIM WOMEN IN RUSSIA

(Complex analysis)

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These observations are the result of many years of comparative studies of the family and the status of women in the muslim regions of the Northern Caucasus, Transcaucasia, and the Central Asia.
Usial sociological techniques connected with mass polls and developped methodology of questionnaires do not always reflect adequately Oriental peculiarities. Life model is the way to overcome the methodical difficulties which are encountered when we try to describe the inner world of Oriental women, her conscience, ancestral mythodology, stereotypes, ways of perception that often exert decisive influence also on the socio-economic and sociopolitical status of women.
Analysing life cycle of a traditional woman we can construct two types of the living way. We can see that the family is the central element of both two types of the living way.
The movement from a large to a nuclear family is obvious. But the current Oriental nuclear family is special. It is not atomized, not self-contained, but interconnected by many effective blood, country-men, clan, patronage and other ties with other families.
One of the signs of stability of a large Oriental family is ability of this institute to enter naturally into nonfamily political institutes, enterpreneurial or ganizations.

These observations are the result of many years of comparative studies of the family and the status of women in the muslim regions of the Northern Caucasus and Transcaucasia, and countries of the Central Asia.
Methods of study of the status of women in the East show that usual scoiological techniques connected with mass polls and developped methodology of questionnaires do not always reflect adequeately Oriental peculiarities. Certainly, we cannot deny significance of studies of the status of Oriental women on the basis of traditional sociological statistics with sampling, massive statistical data. But the strong side of these studies is mainly the analysis of the socioeconomic status of women, and the results of such studies must be

used. At the same time, we must recognise somewhat limited character of these methods when we turn to the sociocultural aspects of the status of Oriental women. Life model is the way to overcome these methodical difficulties which are encountered when we try to describe the innder world of Oriental women, their conscience, ancestral mythology, stereotypes, ways of perception that often exert decisive influence also on the socioeconomic and sociopolitical status of women.

Due to all these circumstances, as well as specificity of our material, we have to turn to the tradition which has already become classical in foreign sociology, and which studies social processes in terms of life. First of all, this tradition is rooted in the works of E.Erickson. Life scheme proposed by Erickson, is not connected specifically with women, but, taking into account that it was repeatedly used in concrete sociological studies, we, along with this tradition and considering specificity of our material, construct a modified for our purposes scheme. In the process of his creative activity Erickson, working with different cultures, constructed a scheme of moulding personal identity, which gives a sense of stability and makes the base for developing self-consciousness. In his concept, Erickson tightly correlates the processes of developing self-consciousness with the age stages of life cycles. Erickson shows that such correlation changes, depending on cultural traditions.

Analysing life cycle of a traditional woman in the Central Asia and muslim regions of the Caucasus, we can construct two very tentative schemes:

Rural areas of the Central Asia		Rural areas of the Northern Caucasus and Transcaucasia	
Life cycle of a woman			
Age	Event	Age	Event
0	Birth	0	Birth
1	Weaning	1	Weaning

6	Care for juniors	6	Care for juniors
14	Menstruation	15	Menstruation
15	Marriage	18	Marriage
18	Birth of first child	18	Birth of first child
21	Birth of second child	21	Birth of second child
23	Birth of third child	24	Birth of third child
28	Birth of fourth child	28	Birth of fourth child
33	First child leaves home	29	First child goes to school
34	Birth of fifth child	30	Birth of next children
37	Birth of sixth and next children	36	First child leaves home
39	Becomes grandmother		
44	Climacteric	45	Climacteric
48	Death of husband	60	Death of husband
54	Death	65	Death

You should remeber that all descriptional typological models and, more so, analytical typology are an ideal construction which cannot claim to universally cover and explain all the data. Nevertheless, such ideal constructions can be of certain importance for prognostic models, construction of projective tests in a monographic survey.

For the reason that living way of women is the complex character, we use the special model. This model shows the way on which many factors (socio-economical, cultural, socio-psichological) transform to the "living way" and the role of every factor.

It's important to mention, that "living way" itself makes an adverse effect on the socio-economical, socio-psichological factors, which have been mention above. We receive the system of factors with the feed-back. If one of the factors changes, under the influence of the envrionment, this change spreads over all the system. For example: there is the special situation with women employment in Daghestan. Women have to pick onion for 6 moths per year in the Rostov area of Russia. This situation continues near 5 years and connects with employment problems and increase of income. This factor rises the women employment, family income, but lowers the pertility, breaks the tradition relations within the family, influences on the upbringing and education of children. As a result - "the living way" changes in whole.

Even a cursory glance at the life cycle of the traditional society shows that the family is a central element of life of a woman. Therefore, we shall add analysis of the institute of family in Oriental society to our study.

The nature of labour, professional structure and qualifications as the integral parts of the social structure create specific socio-psychologic values; they shape a variety of attitudes towards social relations including the reproductive behaviour.

Untrafamily behaviour largely depends on educational standards of its members as well, in particular, on the marriage age, the involvement of females in the public production, social mobility and so on. Education tangibly reduces the influence of religious norms on intrafamily behaviour.

The way of life and intrafamily behaviour also depend on whether the family lives in town or countryside. Urban families, as a rule, have less children and use modern means of family planning. Very often, however, the urban way of life is not accepted by the rural migrants who tend to preserve traditional relations in the unusual conditions of megapolis and modern superurbanization.

The existence of different types of families in muslim countries is generated by the peculiarities of their socio-economic processes. A complex family is an integral part of the traditional agrarian society. This type of family differs from the modern-type family by the size as well as by its functions.

There is certain correlation between the form of family organization and the birth-rate. High marriage and birth rates among many peoples and tribes in agrarian countries can be attribtued to by the predominance of the undivided patriarchal clan-type families. A married couple in a big, complex family comprising several generations does not need economic independence. It is easier in such a family to take care of and bring up children.

Large family tradition is closely tied up with the traditional family pattern. The social and economic factors intensify each other. It follows that the large family tradition bring an important element of the traditional family pattern has integral nature and embraces a range of major socio-economic and cultural characteristics.

The tradition of having many children is traced back to the primitive society. It should be pointed out that in the more primitive cultures the family had a stonger influence on the behaviour of the members of society that it is today. Therefore, the intrafamily tradition of having a large family was an effective instrument which ensured the requirements of society in children. Among the reasons that upheld the establishment of this tradition are high infant mortality, large-scale use of child labour in the economy and the desire to reinforce the kin by increasing the number of kinsmen. Multiple kin large family traditions were kept and expanded in modern society. They acquired a different reasoning and later yielded to more powerful socio-economic factors.

It is important to emphasize that the emergence and establishment of traditions is based on the corresponding socioeconomic preconditions. The impact of the superstructural factors on the birth pattern can be assessed only if these preconditions are taken into account.

Disentegration of the traditional economic structures, increase in female employment and urbanization lead to changes in the economic psotions of women; and this has a direct bearing on the socio-psychologic values. Socio-psychologic and cultural values, however, especially the values of the traditional precapitalist society are rather stable. This has a direct impact on the reproductive behaviour as well as on the reproductive values in the family.

* * *

Peculiarities of production and consumption, structures of public relations and power, dissemination of new ideas, crystallization and struggle of political forces, modern achievements and failures in technology, science and education - all are impossible toimagine without understanding of that specific role which is played in these processes by the complex and historically mobile institute of family. This institute is not uniform. In various socio-economic conditions, in various civilizational - cultural contextes, in the atmsphere of different technological priorities this institute, changing itself along with environment, stimulates or inhibits changes of this environment. It is based also on millenia of unconscious or halfconscious socio-historic memory of people, as well as live dynamics of the present day. This mysterious, little studied institute in which many peculiarities of clan, class and ethnic structures are rooted, played and plays a big role in the past, present and future destinies of Oriental countries.

The movement from a large to nuclear family in the East is obvious. But the current Oriental nuclear family is special. It is not atomized, not self-contained, but interconnected by many effective blood, country-men, clan, patronage and other ties with other families.

One of the signs of stability of a large Oriental family is the ability of this institute to enter naturally into non-family political institutes, enterpreneurial organizations. Moreover, in our opinion, dissapearance of large family in the East may be accompanied by serious diffusion of the structures of this institute into socio-economic and socio-political life. As a rule, researchers separate this phenomenon from the analysis of the institute of family proper. But this process is rather interesting for the study of stability of traditional family, because we can expect at least two tendencies, connected with it. First, socio-economic and socio-political institutes will to one extent or another adopt characteristics of the institute of a large family, and reproduce structures of this institute. On the other hand, culture as a whole will thus preserve norms of

a large family, and it is this phenomenon that in favourable conditions, can, in turn, exert opposite influence on the process of destruction of the family.
We believe that in the near future the Oriental family will preserve characteristics of a large as well as of small family, and in this we see its difference from werstern nuclear family. The evaluation stereotype according to which a large family is an obsolete, negative phenomenon, and a nuclear family - a positive one, will evidently be overcome. Most probably, a wider perception of the dynamics and interaction between large and small families, the place and role of Oriental women in these families, will be accepted.

SOME REFLECTIONS ON THE FEMINIST PARADIGMA CONCERNING GENDER AND SCIENCE
(FEMINIST PERSPECTIVE ON SCIENCE)

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The present paper aims at the arguments on a definite change in feminist research paradigma, namely, a transition from static vision to a process, dynamic and developmental vision. From epistemological point of view, the transition from the classical science to the modern one could serve as a basis and a model of the change in question.

In my opinion, the term "Feminism" can be interpreted as a social movement, as a political practice, etc., however, from a scientific point of view, it is essentially a kind of philosophy. The topic of this paper is inspired by the brilliant book of E.F. Keller "Reflections on Gender and Science". I shall do a brief summary and comments on E. Keller's book and then I shall share my point of view on the same matter.

The issue analyzes the cross-point between two domains: Feminist Theory and Philosophy and Sociology of Science. Traditionally, the social studies of science do not consider the role of gender in the structure of science and scientific thought, and, in turn, Feminist Theory slightly concerns science. Interrelations and penetrations between the two mentioned domains seems to be productive for both of them.

The main problem in the book is the genderization of science. What does it mean? Behind the concept "Genderization of Science" does not stand male or female perspective of science, neither the juxtaposition, complementarity or substitution of the two perspectives. The general thesis of E. Keller is that there is a certain system of beliefs about the meanings of masculine and feminine embedded (through the language of metaphors) in scientific thought and in scientific description of reality. The crucial question is how the idea or the ideal of masculinity has affected the nature of science, or how the making of men and women (as socially constructed categories) has affected the making of science.

For example, in academic community, association between masculine and objective, between masculine and scientific, has a status of a myth, of something being "self-evident". E. Keller examined the roots, origin and reasons of this myth in order to:

1) Destroy and deny it;
2) Explain how this myth or system of beliefs and associations influences the description and understanding of scientific reality;
3) Trace the strategy of change in Feminism criticism. The approach applied to the investigation is that of psychoanalysis and cognitive psychology.

According to E. Keller, the implications of attributing masculinity to the very nature of scientific thought are as follows:1)

"Having divided the world into two parts - the knower (mind) and the knowable (nature) - scientific ideology goes on to prescribe a very specific relation between the two. It prescribes the interactions which can consummate this union, that is, which can lead to knowledge. Not only are mind and nature assigned gender, but in characterizing scientific and objective thought as masculine, the very activity by which the knower can acquire knowledge is also genderized. The relation specified between knower and known is one of distance and separation. It is that between a subject and an object radically divided, which is to say, no worldly relation. Simply put, nature is objectified. Bacon's "chaste and lawful marriage" is consummated through reason rather than feeling, through "observation" rather than "immediate" sensory experience. The modes of intercourse are defined so as to ensure emotional and physical inviolability for the subject. Concurrent with the division of the world into subject and object is, accordingly, a division of the forms of knowledge into "subjective" and "objective". The scientific mind is set apart from what is to be known, that is, from nature, and its autonomy - and hence the reciprocal autonomy of the object - is guaranteed (or so it had traditionally been assumed) by setting apart its modes of knowing from those in which that dichotomy is threatened. In this process, the characterization of both the scientific mind and its modes of access to knowledge as masculine is indeed significant. Masculine here connotes, as it so often does, autonomy, separation and distance. It connotes radical rejection of any commingling of subject and object, which are, it now appears, quite consistently identified as male and female".

In this sense, I should like to draw your attention and to stress that thus outlined objectivist epistemology formed in male-centered tradition, i.e. the epistemology which radically excluded and totally removed the subject from the description of the object (of the reality), worked successfully in the classical science, but not in the modern science, especially contemporary physics. Following Y. Wheeler, quantum mechanics imposes an entirely new view on physical reality according to which the scientist from the position of an observer of an "external" reality turns into "participant of the creation of reality"[2].

I share the common vision of E. Keller that the Feminist perspective on science aims to explore the roots of dichotomies like subjectivity versus objectivity, nature versus mind, feeling versus reason, etc. and to examine the interdependence of these dichotomies.

My thesis is that the three goals mentioned could be reached more successfully from the cultural stand, i.e. replacing the psychological approach with the philosophical one.

I would like to begin by quoting Hegel's thought that what we are in philosophy and in science is what we are historically, which is due to tradition [3]. Now, if we look into cultural tradition itself, which forms specific structures of thinking and a specific approach to the analysis of the world, we can say that on a worldwide scale there exist two cultural traditions, namely, the European one and that of the Far East (China, India and Japan). Within the framework of the former there were formed classical Greek philosophy and classical science.

The European cultural tradition is characteristic with its intention of building up constructions with clearly distinct and mutually excluding opposites; for example, the explicit opposition of God to Personality, reason to feeling, object to subject, nature to mind, etc. The Far East Cultural Tradition characterizes with the tendency to the obscurity and unity of the opposites, to mutual penetration and mixing of opposite concepts.

In this connection, we may introduce two conditional models for the world, and especially for the development of world:

A. White or Black - dual (European) model of reality;
B. White becomes Black - bi-uniform (Chinese) model of reality.

While in model A. the clash of the opposites leads to destruction of a structure and its change with another, in model B. the development of the world is at the expense of the transition of the first opposite to the second within the framework of one and the same structure.

In this sense we could also speak of a dual (European) and bi-uniform (Chinese) patterns of thinking. The logic concept "dual" means a thinking based on the dichotomic principle.

In our opinion, the key point in differentiating the European from the Eastern way of thinking is to clarify the specific features of the dialectics within the framework of the dual and the bi-uniform patterns, respectively. The European model of thinking can be dialectical or non-dialectical without losing its duality. Hegelian dialectic, for instance, can be defined as dichotomic dialectic despite his triads. In Chinese model we come upon a different kind of dialectic, which is based on the unity of the opposites and not on the struggle between them. The core of this dialectic is not polarity, but harmony. Polarity itself leads to harmony and not to negation or reduction of one of the opposites to the other. Whereas in Hegelian dichotomic dialectic the emphasis is on the differences within the unity or on the idea to decompose the identity into its opposites, in the bi-uniform Chinese model the emphasis is on the preservation of the unity even in the differences and on the idea of incorporating all opposites within one whole, thus eliminating the differences. In the latter, the differences are regarded only as merging into the unity comprising them. Unity (synthesis) cannot be achieved by assembling the elements of dichotomy, it is primary.

The ancient Chinese philosophy and the West European philosophy are based on two different ontological models with two different leitmotifs: "The unity of two opposite principles" and respectively, "The juxtaposition of two opposite principles". These two traditional ontological models developed into two relatively stable and distinctive ways of thinking in the course of development of the two cultures - the Far East culture and the European culture. Comparing the East way of thinking with that of the West, it can be said that "The East sees unity and overlooks difference, while the West sees difference and forgets unity". According to the Japanese scholar A. Onda: "The difference-between European and Eastern value judgment chiefly arises from the difference in their respective models of thinking. Eastern philosophy emphasizes intuitive thinking and sees individual nature and society as a whole. It therefore pays more attention to the introversive, intimate, spiritual, objective, harmonious and emotional feelings, meditation, tolerance and softness. Western philosophy, however, pays more attention to logical analysis, thus stressing a kind of extrinsic, individual, right observing, utilitarian, antithetical and logical rationality[4]".

GENERAL CONCLUSION

The change in Feminist research paradigma aims at the transformation of the very category of male and female, of mind and nature in the context of new process dynamic conception of reality derived from modern science and perhaps from the Far Eastern Philosophy.

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III RESEARCH METHODOLOGY AND EVALUATION RESEARCH

11 Evaluation of intervention strategies

PROJECT ORGANIZED UNIVERSITY STUDIES IN SCIENCE: GENDER, METACOGNITION AND QUALITY OF LEARNING

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The principles behind a Danish model of project-organized university studies in science are presented and discussed in the light of twenty years experience at Roskilde University. In this period the proportion of female science students has increased from 20% to 50%. – The Danish project model is discussed in the light of recommendations from research on gender and science education and learning theory of science education. The importance of metacognition is stressed and related to project evaluation. Project studies seem to fulfil many of the criteria from this research, although further development is desirable.

While changes in curriculum, pedagogy and organisation of school science are often discussed from a gender perspective and in the light of learning theory, university science education tends to maintain its traditional style of teaching. Reqruitment concerns, however, has led many universities to change their introductory programmes, and the possibility of introducing project work in single subjects (in addition to the final thesis) are now considered at many institutions. It might therefore be of value for others to learn about the ideas behind and the experiences from an alternative[1] Danish university. In addition project work has many of the characteristics recommended for gender-inclusive science education.

PROJECTS IN SCIENCE: THE RUC-MODEL.

Roskilde University (RUC) was founded in 1972 on the principles of problem orientation and project-organization. From the first day at the university the students work in project groups with a high degree of participant direction and control. Project work occupies at least 50% of the study time and is complemented by traditional courses. Projects also play an important role in evaluations/-

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[1] Aalborg University (1974-) is also mainly project-organized, but differs slightly in programmes and practice. See also the contribution of Anette Kolmos.

examinations.

All students are required to take a two year general basic studies programme in either science, humanities or social science. The interdisciplinary basic study programme is followed by specialized degree programmes focussing on one or two subjects. The total duration of a course of study at Roskilde University is 3 to 8 years, depending on the degree chosen. Also the specialized programmes (e.g. for Master Degrees) are project-organized.

In the following I will focus on the two year introductory Basic Study Programme of Science (called NAT-BAS) although most of the described features are common for all programmes at Roskilde University. Typically a student must follow two courses (six hours/week each, excl. homework) and complete one project each semester. Many students would say that in reality they spend more than half their study time on project work. NAT-BAS courses are evaluated internally by the teacher. (In the specialized courses in the disciplines, e.g. of physics, students have written examinations with external examiners.) Science at Roskilde University includes the disciplines of Mathematics, Physics, Chemistry, Biology, Geography, Computer Science and partly the area of Technological and Socio-Economic Planning.

The Danish concept of projects.

It is important to emphasize that the Danish concept of project work can be identified neither as just an extended kind of group work nor as a special sort of exercise. The concept is closely related to a line of educational thinking and philosophy, in Danish identified as "experiental learning", which is similar to, but not the same as, learning by doing, or learning by experience. "Experiental learning" deals with learning processes as integrated aspects of the individual's total development, influenced by personal history, life conditions, situation, interests, motivation, etc. A central issue in project work is therefore the student's participation in and responsibility for all important decisions in the qualification process (Illeris, 1992).

Methodologically, project work is based on three fundamental theoretical principles: *Problem orientation* indicates - in contrast to the traditional subject or discipline orientation - that the starting point for the work is a problem or a set of problems. *Participant direction* indicates that the studies should be directed jointly by students and tutors. While all participants are equal, they have different functions and responsibilities. This makes the role of the tutor[2] particularly demanding. He or she has a specific professional responsibility, but must act in agreement with the students and has no means of forcing them to accept his or her suggestions or standpoints. *Exemplarity* indicates that the problems and content material chosen should be representative of a larger and essential area of reality. Through deep and serious work on a genuine problem of personal interest the underlying structures of the problem area are uncovered, and this enables students to generalize their insight into new contexts (Illeris, 1992). – This idealistic/theoretical concept of exemplary projects are slightly modified in accordance with the character and subject-matter of science.

Phases of project work.

The choice of a theme. Project groups are usually formed on the basis of interests in a theme or a very general question. The theme should be chosen in accordance with the "principle of exemplarity" so that it brings in, simultanously, the commitment of the students and a relevant content area. In addition the project in 1.– 3. semester of NAT-BAS must respectively illuminate certain prescribed perspectives of science: science and society, experiments and the role of mathematical models, history or science of science and/or communication of science-related problems.

The problem formulation. In order to focus on the topic of the project the group must now gain more knowledge about the theme (with the help of its tutor and the library). In this phase the specific problems that the project is to deal with should be formulated precisely – a process that will also uncover a lot of bias and differences in the project group and force the group to make a series of fundamental desicions. The problem formulation is a very significant issue in the project method, and it is important that both students and tutor pay the utmost attention to detaills in the formulation, as it should function as 1) a common statement of what the group has agreed on and 2) a structuring element for the project work.

Other phases of the project follow: *the practical planning, the investigation phase, the product phase* (in which a report is produced – often under severe time pressure) and *the evaluation phase*, which I will descibe in the next section. Of course this description is only an illustration. In fact not all phases will occur in all projects, the order may be changed, it is possible to be in two or more phases at the same time, or to return to earlier phases.

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[2] As the role of the teacher in project work is very different from the traditional role of a university science teacher, we use the term project-guide or tutor.

Evaluation of product and process. At the end of the term the project group writes a report on its problem analysis, investigations and results. The project report is subject to an internal and sometimes (as in the final project in NAT-BAS and all projects in the specialized programmes) also an external evaluation (oral examination with an external examiner from outside the university). The students must present their results at a project seminar for other students and teachers in "the house" (i.e. the group of about 100 students who work in a certain section of the campus and who share a group of tutors and a secretary). After the presentation, the group must participate in a critical discussion of their project. Another project group and teacher act as critics. A less formal project seminar is arranged approximately half way through the semester. Thus each project group presents its work to a critical audience twice and acts as critic to other groups twice each semester.

Afterwards the group members and the tutor evaluate the report and the performance at the project seminars. Also the work processes: the problem formulation, the planning, the collaboration between the group members, the participation and contribution of the individual student and the tutor are evaluated at group evaluation meetings.

Percentage of female students in science at Roskilde University.

The proportion of female students starting in the basic study programme in science has risen from 15 - 20% in 1972 - 74 to about 50% in the last years (see Fig.1). Also the percentage of female students at the specialized programmes in the different disciplines of science has risen in the years, as is seen from Fig.2.

The much bigger Copenhagen University has experienced an increase in the female proportion of science students from 26% in 1979 to 35% in 1989 (Vedelsby, 1991). Comparison between the different universities should be undertaken with care, as they are not necessarily atracting the same type of students and because more restricted admission rules were forced upon Copenhagen University a couple of years before Roskilde University. In addition the number of female students in math, chemistry and especially in physics has been small and fluctuating through the years.

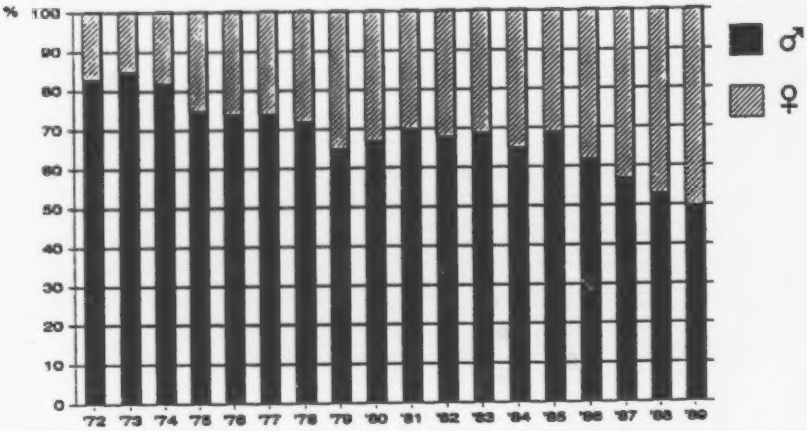

__Fig.1.__ The distribution by gender of (1. and 2. year) students at NAT–BAS from 1972 to 1989. (RUC – Administration, 1991).

RUC: FEMALE PERCENTAGE (ABS.NUMBER) IN DIFFERENT SCIENCES:					
	Biology % (N)	Chemistry % (N)	Physics % (N)	Math. % (N)	Comp.Sci % (N)
1980/84	38 (53)	38 (18)	14 (6)	31 (22)	32 (46)
1985/89	43 (87)	43 (42)	33 (14)	40 (25)	43 (54)
1990/92	—	--	33 (14)	53 (39)	—

__Fig.2.__ Percentage of new female students of the year in different sciences (students that after NAT–BAS continue in a specialized programme, normally heading for a master degree). (Mette Vedelsby, 1991, and for 1990/92: RUC administration).

PROJECT STUDY AND THE GENDER PERSPECTIVE.

Many GASAT investigations in school classrooms have demonstrated gender differences in interests, attitudes and also in learning style and preferred style of teaching. Some results from this research will be related to the model of project work. (As references among many others see e.g. Beyer 1991; Beyer and Reich 1987; Beyer et al 1988; Blegaa and Reich 1987: Sørensen 1991; Vedelsby 1987.)

What at first glance seems to be girls lack of interest in or even opposition to science and technology is often an indication of more serious concerns of relevance (Grant and Harding, 1987). While some male students show a unconditional fascination for a piece of technology per se, *many females have questions about relevance and implications for people and environment.*

The project studies at RUC encourage the students to choose problems that they conceive as relevant for other people, culture, society or environment. The process of "problem formulation", the investigation phase and the final project report should reflect the treatment of not only HOW questions but also WHY and FOR/BY WHOM questions.

Female students often stress the importance of verbal discussions of difficult concepts, of human relations in classroom, and of collaboration in groups. Project work emphasizes these aspects, but of course there is no 100% guarantee that group proccesses are warm and supportive and that group discussions are always open minded and constructive. The tutor has an important (and difficult) role to play in helping the groups improve the processes without taking over control and responsibility!

Girls like to be personally involved in the learning activities, to take responsibility and to use many aspects of their personality. This is the heart of project work: the personal commitment in the work on exemplary problems. Project studies not only give room for the responsibility of the students, "participant direction" is a central part of the Danish model of project work. The work processes and results, the writing of the project report as well as the project seminar in the end of the term gain from the effort of reflective and creative students. But of course some students are not really looking for deeper academic cognition and hard work: they take NAT-BAS as a mere continuation of school and try to do the minimum. Sometimes you can persuade them, but you cannot impose responsibility, commitment or challenge on other persons!

Female students require that work processes as well as products are treated *seriously. They want to know what they are doing and why. Human relations and patterns of collaboration should be of quality.* The running internal evaluation in the project group and the midpoint and final evaluation in the "NAT–BAS house" tend to stress all these aspects. Metacognition (see below) is very important. The scientific/academic contribution and the style of collaboration of the individual student as well as the functioning of the group as a whole is specially evaluated at a post–evaluation meeting with the tutor after the project seminar at the end of each term.

Although I have given only a brief outline of the RUC–model, I think it is fair to conclude that project–organized university studies fulfil many of the requirements of gender–inclusive science education. Nevertheless, even the RUC project model does not perform miracles! Project–organized studies are relevant but difficult and personally demanding – although in another way than traditional university courses. And the students and teachers of real life do not always represent the needed ambitions and/or qualifications!

PROJECT STUDIES AND LEARNING THEORY.

Most science educators nowadays refer to a kind of learning theory or model that is compatible with a general constructivist view. The learner is placed in the center: the student constructs his/her own concepts and understanding. Sometimes considerations of pupils' attitudes and interests are added, but learning is still regarded as a mainly cognitive phenomenon, and affective aspects of learning are not serously integrated in the model or theory. Research in "gender and science" in classrooms have stressed the need for a learning theory that incorporates metacognition, classroom climate, the context of learning and the important interplay between affective and cognitive factors. (Vedelsby 1987; Beyer & Reich 1987; Beyer 1991).

Baird et al. (1991a,b) have formulated a theoretical basis for their R&D work on Teaching and Learning of Science in Schools that is in good accordance with this view. As illustrated in Fig.3 the interplay between affective and cognitive aspects of learning is taken as a starting point. The authors further stress the importance of the learners' 1) involvement and perception of challenge and 2) reflections that leed to metacognition and are supported by collaboration. When these aspects are present and balanced, the result is higher quality in learning.

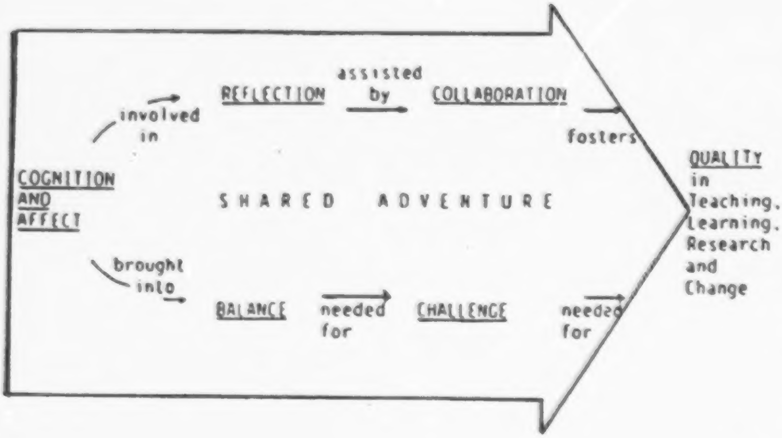
COGNITION AND AFFECT
involved in
REFLECTION
assisted by
COLLABORATION
fosters
SHARED ADVENTURE
brought into
BALANCE
needed for
CHALLENGE
needed for
QUALITY in Teaching, Learning, Research and Change

Fig.3. Cognitive and affective factors in balance is needed for the perception of challenge. These factors are also involved in reflective thinking which is supported by collaboration. When both these lines are satisfied, the posibility for quality in learning develops. When both teacher and students perceive a challenge and reflect consiously on their teaching/learning activities, the result is "a shared adventure" and improved quality of both teaching and learning can occur. (Baird et al. 1991a).

Baird et al. do not discuss gender differences in science education, but their problem formulations and theoretical basis reflect their experiences from close collaboration with teachers and students in real classrooms. This makes their work valuable – also in relation to gender. As mentioned above, they stress many of the same aspects of learning as we (and others) do in realtion to gender and science.

I find the Danish concept of project study in good agreement with this theory. Commitment and perception of challenge are important attributes of students' involvement in project work, and collaboration and reflections leading to metacognition are a central part of what is aimed at. This is emphasized by the form of evaluation of project work (see above), that is still maintained – despite the pressure from outside (and sometimes also from inside) to introduce more traditional examinations.

Metacognition means "learning how to learn". It includes *knowledge* about learning/cognition processes, *awareness* of, and *control* of personal learning practice. There is interdependence between constructivist processes of purposeful enquiry based on reflection, and outcomes related to enhanced metacognition (Baird et al, 1991a). Metacognition must develop in a context it cannot be taught independently. In project work group collaboration and collective (and individual) reflections on outcomes and processes present the needed common experiences. A number of serious evaluation discussions in the project group (some of them including the tutor) facilitates metacognition.

In real life at NAT-BAS/Roskilde University this ideal is realized to a certain degree, but not entirely. Among the reasons are time pressure (for students as well as for teachers) and lack of qualifications among the teachers/tutors. As Baird et al (1991b) emphasize, "changes in metacognition of students can occur only after changes in the teachers' attitudes, perceptions, conceptions, and abilities; that is, development of teachers' metacognition must precede that of their students". Danish university teachers are under an obligation to do research as well as to teach. Science teachers in particular might feel a discrepancy between 1) the effort of supporting students' personal development and metacognition and 2) their own research efforts and interests in science. This problem is probably less pronounced among school teachers.

CONCLUSION

As a case (from real life!) the alternative programme of project studies of Roskilde University has been presented. It is our overall experience that graduates from RUC are doing at least equally well as graduates from the traditional Danish universities on the labour market. During the 1980's there has been a significant increase in the percentage of female science students at RUC.

The principles of the project model have been introduced and discussed in relation to research in "gender and science" and "science education and learning theory". Project work seems to fulfill many of the criteria from this research. However, there are still problems to overcome, some of which have been indicated above. *Project studies are challenging and difficult for both teachers and students.* A further development of the method and teacher qualifications is required, but the basic ideas of project organization have come to stay!

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Technology assessment and women's studies:
where do they meet?

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Research into the social aspects of technology: its influence on society, and the influence of society on technological development, is currently called technology assessment.
Some people see it as a separate branch of technological research, others think elements of technology assessment should be included in subject specific research, such as information technology, reproductive technology, energy, environment, transport, etc.
Research into the aspects of technology and women: its influence on women, and the (lack of) influence of women on technological development, is currently called women's studies. Some people see it as a separate subject, others think it should be included in subject specific research such as sociology, history, mathematics, etc.
In spite of the rather similar situation of the two, there are few connections between technology assessment and women's studies.
A major technology assessment project, MONITOR, executed within the context of the European Community, is described. It is analysed on the place it gives to women in the research. There is very little specific attention.
Then some indications are given how technology assessment research can take women's issues more into account.

1 *The concept of technology*

In the past ten years the literature on 'women and technology' has increased rapidly. Part of this literature dealt with 'how to get women into technology and technical professions', and was mainly focussed on intervention.
The other part challenged the traditional concept of technology. It analysed the definitions and concepts of technology. Technology as the application of scientific and other knowledge to practical tasks in order to adapt the environment to human needs is in itself a broad concept. In prac-

tice, although " nearly all women's work falls within the usual definition of technology" (Pacey, 1983, p. 104), it turned out that a specific set ot activities became defined as technical. Pacey describes the process in these terms: " Technology...is a term conventionally defined by men to indicate a range of activities in which they happen to be interested" (Pacey, 1983, p. 104). Much effort has gone into de-construction of the concept in order to show that women's activities are also technical, and to transform the actual practice of technical teaching and working, in order to make these fields more attractive for women.

More or less the same procedure can be followed for technology assessment. What is it, where and how is it applied, is this relevant for women, and if not, how could it be made more relevant?

2 The concept of technology assessment

Technology assessment (TA) is not a single concept. There are many definitions, and different types of TA have been developed.
De Raaf (1992) cites this one of Vary Coates: "Technology Assessment is the systematic identification, analysis and evaluation of the potential secondary consequences (whether beneficial or detrimental) of technology in terms of its impact on social, cultural, political, economic and environmental systems and processes. Technology Assessment is intended to provide a neutral decision-making process".
Gruppelaar (1990), who defines TA as " the qualitative analysis and appreciation of technology" would not agree on Coates' last statement, which would be too rationalistic. For him, any process of reflecting on technology is itself influenced by technology. Technology is so pervasive in our society, that criticism on technology or alternatives are themselves technological, and our values have been shaped by technological performance. What is at stake is not so

much the technology, but the organization of society and concepts of the human being. TA is political technology, it is a technology of alternatives. TA is an instrument which enables other than technical aspects to be of influence on technological development. This approach looks more at ethical and political questions than at technical.

Traditional TA looks into the effects of existing technologies, it shows different options for technical development, in order to enable decision-makers to make good future choices. It develops 'early warning systems' against possible detrimental effects.

Constructive Technology Assessment looks at the technology during the process of development, and tries to influence choices during that process. Constructive Technology Assessment is also used in a market perspective, in order to develop the products which are responding to the needs of people.

Prospective technology assessment is a forecasting technique which analyses social developments and material needs, in order to direct technical developments.

TA asks for continuous assessment of technology. It is therefore also related to evaluation.

3 *The practice of technology assessment*

Whatever definition or variety of TA is used, each one is gender-neutrally defined, and could be applied to any analysis. We shall now have a closer look at the practice of TA, in order to see what type of issues are dealt with, what kind or questions are examined, and which aspects of society are considered important. The aim is to see whether issues which are important for women are getting (even) attention.

The analysis will be done by studying as an example the TA programme among the research and development programmes of the European Communities, called MONITOR. The program is chosen because it encompasses a well defined set of research projects, in which different member states are involved.

4 *MONITOR*

The aim of the MONITOR programme is to identify new directions and priorities for the Community research and technology development policy. Its clients are the Commission services, the European Parliament, the Social and Economic Committee, and the Member States (MONITOR, 1992).

The programme started in 1989 and consists of three subprogrammes: SAST, FAST and SPEAR.

SAST (Strategic Analysis in Science and Technology) undertakes strategic analyses in selected areas of science and technology development aimed at formulating proposals for short and medium term policy RTD (research and technological development) initiatives.

FAST (Forecasting and Assessment in Science and Technology) studies the main changes likely to occur in the relationship between society, economy, science and technology, through global and long-term analyses.

A closer look into the research projects now.

SAST has currently 10 projects. They deal with:

1. Possibilities for co-operation between selected advanced developing countries and the Community.
2. Standards, technical regulations and quality assurance services.
3. Environmental problems in relation to transport.
4. Innovation in agro-biotechnology.
5. Setting priorities for R&D.
6. Fresh water resources.
7. Plastics waste management.
8. Services and technological innovation.
9. Freight logistics.
10. Integration of environmental and economic development objectives.

The aim of the programme is to study science and technology for future policy, taking into account the socio-economic context. What becomes clear from the topics is that the economic context is very much dealing with the public sphere, as is the social aspect. Women are not explicitly addressed. Yet, several topics have their interest for women too.

The forecasting programme FAST has some interesting dossiers:

1. Socio-economic cohesion of the European Communities.
2. Globalization of technology and economy.
3. Regions.
4. Future of European cities.
5. Future of industry in Europe.
6. Cohesion with Middle and Eastern Europe.
7. Global perspective 2010: tasks for science and technology.

The forecasting takes place at a rather abstract level. Though the topics may have their interest for women, a closer looks shows they are not very present. The project on European cities for example deals with transportation, with industry, and with key actors such as municipalities and chambers of commerce.

More promising are the applied technology asessment studies of FAST on:

1. Anthropocentric production systems.
2. Health technologies.

Anthropocentric systems..the term evokes visions of people, women and men, in a humane working environment. In fact, it is more a management technique for greater competition. And, as the final report warns at its first pages:
" Anthropocentric Production Systems (APS) are perceived as a productive and competitive tool for industrial modernisation. They are not a derivative of social policies or the humanisation of working life" (Wobbe, 1992, p. VII).

The project Health technologies deals with the decentralization of health care systems.

The SPEAR programme carries out methodological projects.

What we can deduce from a brief analysis of the MONITOR programme is that it is not exempt from women's studies potential. Since it deals with technology and socio-economic issues, it could deal with women's issues in particular. Which means questions such as:
does the technology have a special effect on women, their health, their housing conditions, their employment, their working conditions, etc.
What we see is a programme with interesting topics, but so 'gender neutral' that women are practically absent. This is reinforced by the mainly economic orientation of the Community R&D efforts. Economic growth and cohesion are important. Women's interests in the public sphere will be taken into account if relevant for this purpose. The private sphere of women is hardly considered. It could be discovered in a question about safety in a study on new big cities (Drewett, Knight, Schubert, 1992) in which for the rest it is not asked whether women have different needs from men.

5 *Women's studies and Technology Assessment*

A broader look at other TA projects shows that women are mostly absent as specific category. Does this mean that nothing is known about the effect of various technologies on women's lifes, or about the relationship between women and technology?
Fortunately not. There is abundant literature about, for example, the effect of new technologies on women's employment, the effects of reproductive techniques, the effect of household technology on the hours women spend on their household. Or the influence of the environment on physical safety, or the effects of communication devices as the

telephone.
This literature is confined to the domain "women's studies". What is needed is that more technology researchers get to know it.
The same is true for forecasting studies. The most important one in the Netherlands is the scenarioproject of the Equal Opportunities Council, in which the conditions for and the effects of equal participation of women and men in the labourmarket are calculated (Emancipatieraad, 1989). This major study, which calculates the economic effects of equal positions of women and men in society- and shows a benefit for the state!- is seldomly cited.

Women's studies has in common with TA research its interdisciplinary and hybrid character: on the one hand, women's studies wants to be a field in its own. On the other hand, the topics and methods of women's studies must become integrated in other disciplines as well.
TA is in a similar situation, as it is in between technical and social research. TA research should be conducted on its own. At the same time, elements of TA should be integrated in the specific technical research.
Now there also has to come a bridge between women's studies and TA, so that TA researchers learn to pose some of the questions of women's studies. To this end, it should be good to develop a kind of checklist of relevant issues, which TA researchers can use in formulating problems and in making questionnaires. Such a checklist could be part of a small handbook on How to incorporate women's issues in TA research.
TA research can cover all possible domains. The checklist should consist of a general part, with indications such as:
break down women and men in statistics,
differentiate questionnaires, ask for sex of respondents,
report on sex (differences).
Then a number of domains should be selected, for which relevant hints could be given.

To stay with the example of the city:
has transportation the same meaning for men and women (men move around in cars, women use public transport);
how is the distance work-home (women want to be close to home because of family obligations);
how is the distance home-work-schools;
has tele-working the same meaning for women and men (responsibility for children);
what effect have new communication devices on contacts between neighbours and friends;
what effect has the price of new technical devices on lower incomes (often women).
Similar type of questions should be formulated for other domains.

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GIVING GIRLS A TASTE OF TECHNOLOGY

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Initiatives in the form of short courses to encourage girls to consider a science or technological career can be successful. Results of research carried out on girls during a four day residential "Taste of Technology" course demonstrate that short courses are a suitable way to disseminate information and give girls an insight into certain careers which they may have not thought available to them. The results produced in the paper evaluate a four day residential course held for sixth form girls at Oxford Polytechnic at Easter 1992. The paper will suggest some ways in which these types of courses can be used to encourage girls to consider technology careers and will highlight the strengths and weaknesses of this particular course. In addition the paper will discuss ways in which the course can be modified to include younger girls or more students.

Introduction

Short courses designed to give girls information about careers in engineering, science and technology have become increasingly popular. This paper examines in detail a four day residential "Taste of Technology" course for female students held at Oxford Polytechnic. First, it describes the format of the course and the background of the students attending. It then assesses the success of the course by comparing the knowledge of the students before and after the course. Finally, it looks at some alternatives and discusses the advantages and drawbacks of the Taste of Technology course at Oxford Polytechnic when compared with these.

A Brief Examination of the Taste of Technology Course

The students who attended the Taste of Technology course were aged between 16 and 18, and most were studying for A levels in science and technology subjects although not necessarily considering a career with these qualifications. They came from schools in Oxfordshire where they found out about the course primarily from sixth form tutors and science tutors at their schools. These tutors were sent the initial recruitment information and were asked to distribute it to any suitable female students. There was a large response and not all applicants could be accepted. The girls were chosen on the basis of their A level subjects and their replies to a question on an application form which asked why they would like to participate in the course. Their answers plus their A level subjects were used to determine their suitability for the course.

The course had seven main aims which fell into two broad categories: the first to give an insight into industry and the second to build the confidence of the female students. The aims as stated in the literature to schools were:

"To offer a very positive experience as a way of attracting females to engineering industries; To provide female role models from industry and academia; To show the females that a career in British engineering industry is rewarding by giving them "hands on" , "real" industrial experience; To provide a variety of industrial projects in a range of engineering disciplines; to give confidence boosting activities (communication skills, presentation skills); To provide a highly motivating experience helping the girls to choose their future industrial career with a much greater degree of commitment; and to illustrate the benefit of teamwork".

To ensure that these aims were fulfilled, a variety of activities and events were planned during the course. Events included lectures from women in industry and women in academe, students getting involved in industrial projects with local and national companies, team projects like designing, constructing and testing aluminium bridges, individual projects plus visits to technological companies. The students had to present their projects to the rest of the course and were given practical advice on how to present effectively. They were encouraged to use equipment such as lathes and drills as well as sophisticated precision machinery. The students also visited laboratories in the

Polytechnic and in some companies and they were able to take part in experiments underway in these laboratories.

Funding for the course came from a variety of sources. Many industrial companies contributed by running projects or organising visits to their factories or laboratories and also providing resources and staff for the course. Financial contributions came from industrial sponsors, trust funds, and the Polytechnic. The Polytechnic gave staff, rooms and resources. A total of £9,000 was required for the residential course; the equivalent of £150 per student. The main cost was the provision of accommodation and food for the students.

Research Methodology

Quantitive and qualitative research methods were used to evaluate the course. These included a pre-course questionnaire, a post-course questionnaire plus observations and discussions with the students. The response rate for the pre-course questionnaires was 89% and the post course questionnaire was 75%. The pre-course questionnaires were distributed and collected from the individual students before any activities or events took place. The post-course questionnaire was distributed after all activities and events had been completed. Observations and discussions with the students took place during the events and also during free time and lunch times.

The Pre-Course Questionnaire

The pre-course questionnaire consisted of two sections. The first section contained ten profile questions which determined age, occupation of parents and siblings, type of school, GCSE qualifications and grade, strongest subjects at school, weakest subjects at school, hobbies and interests outside school, A level subjects currently being studied, and intended university courses (if any).

The second section examined attitudes towards a number of issues in Likert type response questions, explored their rating of factors important when choosing a career, and analyzed their knowledge of the type of work and A level subjects required for ten science and technological professions. The answers most relevant to this paper are examined in detail below.

78% of the students on the course were considering higher education and had some type of course in mind. The students appeared to be aware of the range of courses available in higher education through school literature. Their information about careers came from a collection of sources including careers advisors who most of the students had at some stage been interviewed and directed by. A few students were considering engineering and science as a degree course with a view to working in a technological field. The most popular courses were in the biological sciences such as medicine, dentistry, biology and genetics. Other popular courses were law, business and accountancy. Chemistry and mathematics were also considered by some of the students as were environmental sciences, natural science and biochemistry. Of the students considering engineering, mechanical, civil and chemical were the courses that were listed. When asked, in discussions, about the type of courses that the students were considering, it became clear the few had detailed knowledge of their intended careers. For instance, students considering civil engineering had only a vague idea of what a civil engineer actually did. Further discussions revealed that the students had made attempts to find out about careers but that they felt that information on many careers was not adequate. Evidence of this is borne out in the response to one of the questions which asked why the students came on the course. The most common response was the wanted an insight into different careers and the second most common response was the course would help them choose a career. Other responses in order of most frequent citation were: they would meet people with similar interests, would get an insight into university life, discover the role of women in industry, help with presentations, working in teams and gain "hands on" experience. In essence, their aims were similar to the aims of the course.

The students were asked to state what ten given professions did. The ten professions were chosen on the grounds that they were likely to be mentioned at some stage during the course. In particular, some of the professions such as civil engineering, mechanical engineering and electronic engineering would receive a good deal of exposure since projects and lectures were specifically about them. Lectures given by mainly women scientists and engineers would also give the students information about some of these and other professions. The professions asked about on the questionnaire were Mechanic, Civil Engineer, Environmentalist, Metallurgist, Mechanical Engineer, Quantity Surveyor, Architect, Botanist, Pharmacist and Electronic Engineer. The most frequent responses to the questions about these professions are analyzed below.

For a mechanic, 10% gave no answer, incorrect answers or did not know. The main response was that a mechanic "repairs machinery" (56%) and "mends cars" (34%). Other responses included "designs and repairs machines" or "gets hands dirty". Less students knew what a civil engineer did; 64% gave no answer, incorrect answers or did not know. Examples of incorrect answers include "works on machinery" or "informs people about engineering". However, the students had more understanding of what an environmentalist did. Only 16% did not know gave incorrect answers or gave no answer. There were a range of answers but the majority of students said something similar to "studies the environment", "studies the impact of technology and farming on the environment" or "checks pollution". Results for a metallurgist showed a lack of knowledge; 56% gave incorrect answers, no answer or did not know. Many students said that they "study metals" but 6% said that they "study stones and rocks". Nearly as many (52%) did not know or gave no or incorrect answers when asked about a mechanical engineer. A few students said that a mechanical engineer was the same as a mechanic but the remaining students replied that they "design mechanical appliances or vehicles". The profession about which the least was known was quantity surveying where 80% of the students did not know or gave no or incorrect answers. Whereas, only 4% of students did not know what an architect did. Most students simply put "designs buildings". Furthermore, only 10% gave no or incorrect answers or did not know what a botanist did. Most students also had some idea of what a pharmacist did where 86% of students giving answers like "makes up and dispatches prescriptions". Unfortunately, for the last profession, electronic engineer, the students had less success where 72% of students did not know or gave incorrect or no answer. There were a wide range of inaccurate answers which included "repairs radios and televisions" or "designs electrical appliances".

It is clear from these results that most of the students lacked knowledge about certain technical, especially engineering, professions. Since this is not an atypical sample of students, it can be assumed that there is widespread ignorance of these and other technical occupations. The next section examines the results of a questionnaire administered to the students after the course.

The Post-Course Questionnaire

This questionnaire assessed the students knowledge after they had experienced the Taste of Technology course. It first asked what the students knew about the same ten professions as the first questionnaire and whether they thought that their knowledge had increased or stayed the same. The students were then asked what they had gained from the course and whether they were more or less likely to choose a career in industry after being on it.

The responses to the post-course questionnaire showed that the students knowledge about all of the professions had increased especially civil, mechanical and electronic engineering. Increases in knowledge were apparent in answers to questions about metallurgy and quantity surveying with almost all the respondents to the second questionnaire giving correct answers. Answers to questions about some of the professions were more thorough. For example, instead of stating that a mechanical engineer "designs mechanical appliances", some students stated that they "design, improve and construct machinery". These answers showed that the students had reached a higher level of understanding of this and other professions during the course. They seemed to appreciate the variety of tasks involved in each profession and for electronic engineer there was less of a range of incorrect answers. These results were very promising and showed that an insight into a variety of careers had been gained.

The final part of the post-course questionnaire asked the students two questions. The first asked them what they had gained from the course and the second question asked them whether they were more, less or just as likely to choose a career in industry. There were many different responses to the first question. Some of the more common ones were: they had gained an insight into types of engineering and careers in industry, been given information about problems and advantages of gender, sponsorships and university, found careers in which they wanted to get involved, met lots of people including women engineers and scientists, acquired more detailed knowledge about many professions, discovered ways of applying and getting jobs in industry, gained experience of careers and living in the polytechnic and gained confidence in being able to accomplish technical projects, working in teams and giving presentations. It is clear from these responses that not only did their factual knowledge, ie about types of careers etc., increase, but their practical knowledge, ie how to give presentations, use technical equipment, work in a team etc., increased.

Further evidence of the success of this course can be found in the students responses to the second question where 40% of the students said that they were more likely to choose a technical career, 20% said that they were less likely to choose a technical career, 30% said that there was no change and the remaining 10% answered that they were more likely to make an informed decision or were going to go into a science or engineering industry anyway.

The Wider Issues Explored

It is clear from the two questionnaires and discussions that the students lacked knowledge about many science, engineering and technical careers when starting the course and were therefore unable to make an informed decision about them. The post-course questionnaire confirmed the success of the Taste of Technology course. The students had increased their factual and practical knowledge and in addition gained confidence in a range of areas such as giving presentations and using technical equipment. This is valuable in itself even for those students who have decided not to enter technical careers. But as the questionnaire shows, 40% of the students considered themselves more likely to work in technical areas. This was a high success rate and was probably caused by the large variety of activities that can be offered on a four day course. There are other types of courses which are designed to give girls an insight into technical careers. Bearing in mind the cost of the Oxford Polytechnic course and the fact that students had to be turned away due to the limited numbers of places, it is clear that the four day residential course is not ideal. But other courses are unable to achieve the depth of insight a longer course can provide. Several factors need to be considered so that the most desirable solution can be achieved. The main factors are length and content of course, size and cost of course, and residential versus daytime only. The Taste of Technology course was aimed at giving an overview of a variety of careers. Four days was seen as the minimum amount of time to achieve this. More focused courses such as a course designed to give information and experiences relating only to chemistry, physics or a particular type of engineering, may not require such a long time. These courses are becoming more popular as individual specialist organisations or academic departments decide to offer their own brand of insight course. However, in doing this, the students will not get a full picture of the range of careers available to those with science qualifications. Attempts to overcome this can be made by including career seminars which give information on a wide range of technical occupations. However, there is some danger that students will be given too much information in too short a time. It is also unlikely that seminars like this will be able to make the careers attractive as they will be unable to provide a variety of activities to complement the factual information. On these courses there are unlikely to be as many students attracted to technological careers as on a four day course. Nethertheless, being narrowly focused does mean that courses will be cheaper. The Taste of Technology course was an expensive course which required full time commitment from some staff to raise money for it. One day non-residential courses are not only cheaper, they can usually accommodate more students. An example of this is at Manchester University where they have discovered that three one day "Women in Physics" courses for 140 students each day cost the equivalent of one three day residential course for 60 students.

An additional problem with residential courses is the need to supervise the students in the evenings. Organisers of residential courses are responsible for the students and this can conflict with the students desire for independence, particularly in the evenings. A possible solution could be a four day non-residential course where students are collected by coach in the mornings from school and returned in the evening. This would cost less since there would be no requirement for accommodation, mean that students are no longer the responsibility of the organisers in the evenings, yet the course would still give a full insight into technical careers.

A final consideration is the age at which a student should attend insight courses. Students after the age of 16 will generally have chosen their A levels. The students on the Taste of Technology course were all studying for science A levels and the course assumed a certain level of competence in science subjects. Some courses are now designed for younger students such as 13 and 15 year old girls and in some cases much younger. The rationale behind this seems to be to encourage more students to pursue science subjects to A level and beyond. However, the age group will vary according to aims of the course and what the course wants to achieve.

Conclusions

The Taste of Technology course proved a successful method of attracting girls to technological careers and providing them with information to help them enter these careers. This was shown in the results of the two questionnaires. It is likely that these successful results could not be achieved on shorter or more narrowly focused courses, although there is scope for further research to assess this. Thus, although the Taste of Technology course is expensive and has limited spaces available, it seems to be an effective way of increasing the number of women entering technical fields.

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IV JOINT EUROPEAN PROJECTS

12 Challenge and perspectives of European projects

Gender Issues within the EC's COMETT Programme and the Influence of the WITEC (Women in Technology in the EC) University Enterprise Training Partnership

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ABSTRACT

The European Community's COMETT Programme is a major initiative in the field of higher level education and training in technology and technical enterprise management. As launched in 1985, 'COMETT One' paid scant attention to gender issues in technology apart from funding a bid from Sheffield University to set up a women in technology network.

The WITEC UETP (Women in Technology in the EC University Enterprise Training Partnership) received limited attention and funding under 'COMETT One' during its three years of operation.

An independant report on COMETT One published in 1991, however, reported some brief statistics on the limited involvement of women in the various aspects of the Programme. Considerable adverse comment resulted from the 'women's lobby' in Brussels, despite the fact that the statistics were actually better than might have been expected by GASAT colleagues.

The WITEC UETP has been asked to increase its advisory services and public relations in the direction of the other 156 UETPs and 'COMETT Two' is now emphasizing equal opportunities as a key objective and monitoring gender aspects of project reports more comprehensively.

The COMETT Programme

The COMETT Programme is the largest single initiative of the European Commission in the area of technological and enterprise education, training and development at the higher and continuing vocational education levels. All EC and EFTA states are now taking part in the COMETT Programme, which places particularly strong emphasis on higher education - industry links and on the development of joint programmes across national boundaries. The programme came into full swing in 1986-97 and has continued in two phases, so called 'COMETT One' and 'COMETT Two'. The COMETT One phase was for the first three full years of operation, while COMETT Two is continuing through 1992-94 with a major review now underway in regard to its further continuation, albeit in a somewhat different form.

The overall aim of COMETT is to rapidly advance the economic competitiveness of Western Europe via 'human resource development', concentrating on the needs of industry and commerce and on natural sciences, technology, engineering and the business/management subjects in the main. COMETT aims to achieve this objective by forging much stronger links between higher education and 'enterprises' in the context of learning initiatives, on a trans-European basis.

The COMETT programme funding arrangements have varied to some extent through its life, but in the simplest terms it can be said to have (via a competitive bidding approach) part-financed:-

i) The development of regional (in one country) and sectorial (transnational and specialised) University enterprise training partnerships (UETPs)

ii) Student and staff transnational 'placement' programmes, where higher education students studying in one country have taken up enterprise-based employment in another country, and 'academic staff' and industrialists' have taken up employment in another country in enterprises and universities respectively.

iii) The development of new post-experience short courses in technological and enterprise development fields.

iv) The development of substantial open/distance learning materials, new technologies for training delivery, and innovative long courses often leading to qualifications.

The target audiences for the new short courses and the longer learning programmes/materials are post-experience technologists and technical managers, normally in employment.

In all four broad areas of funding, COMETT will normally only part-fund projects, with the remaining funding to come from the project partners, which may be universities, companies, employers' organisations, professional institutions, trade unions, etc.

The COMETT programme operates on a very large scale with 157 UETPs now in operation, thousands of students each year involved in the work placement programmes, hundreds of short courses supported, and a vast compendium of open learning programmes and packages already produced and often available commercially. Further information about the COMETT Programme itself is readily available.[2]

Gender issues within the COMETT Programme

Given the difficult situation now prevailing in the U.K. and in other EC states concerning funding for the developments of initiatives for women's development in technology (broadly defined), the European Commission is potentially a very important potential source of finance for this work. I was therefore extremely disappointed to find no reference whatever to the gross under representation of women in technological fields of study or work in Western Europe in any of the initial COMETT documentation. No mention was made of this gender inequality in key COMETT objectives, nor were there any indications of special support for funding bids which took particular account of this problem.

However, the small print of the early documents did make reference to the COMETT programme being an 'equal opportunities" initiative.

I tried to take advantage of this 'admission' by putting forward a proposal to set up a UETP on a transnational sectorial basis specifically focussing on issues and initiatives concerning women in technology. Simultaneously, a women's enterprise development network in Naples put forward a proposal for an Italian UETP for women in enterprise. Although neither side knew of the existence of the other, when the COMETT office in Brussels requested us to come together to produce one overall European network we were pleased to do so. And so the WITEC UETP was born and has since grown to become one of the largest of the UETPs, and we believe one of the most effective and influential of the COMETT projects.

WITEC has been and is heavily involved in all aspects of the COMETT programme and indeed increasingly in relevant activities not funded by COMETT. Further information about WITEC can be obtained from Claire Molyneux, the UETP manager or myself at the GASAT Conference poster session, or subsequently at Sheffield University.

Clearly, one UETP out of 157 UETPs in the COMETT programme cannot hope to overcome all the gender in equalities which exist in the areas specifically addressed by the programme. Indeed, WITEC has by no means been very successful until recently in gaining funds under the various COMETT budget heads relative to other UETPs. This has been in spite of our constant stress on the need to encourage and support initiatives specifically for women.

So, the issue of what if anything the other 156 UETPs, and other COMETT funded project groups, were and are doing to benefit women is a very pertinent one. Our own 'casual' observations suggested that very few COMETT funded projects (other than WITEC of course) were attempting to do anything in particular to help women specifically. Certainly very few of the vast number of short courses advertised through the UETPs network were specifically aimed at women, nor were longer courses for women being promoted.

By 1991 I was feeling very concerned that WITEC was in danger of being regarded as the 'token' UETP for women funded on a small budget to solve consciences in Brussels. Women partners all over Europe were now working very hard for WITEC on a largely 'goodwill' basis and with many demands on them due to the relatively high profile achieved by WITEC. However, a dramatic change was about to unfold. In late summer 1991, I was called to Brussels on an urgent basis to meet with staff of the COMETT Office.

The survey of COMETT One and the statistics in Regard to Gender

The reason for my call to Brussels related to the publication of a report by independent consultants on the COMETT One programme. Without any especial instructions to do so the consultants had decided to include some basic statistics related to gender in their analysis and report. This was made possible by the thoroughness of the COMETT reporting documents, which although irksome do allow detailed analysis of all sorts of factors.

What the consultants reported was that women were under-represented in the COMETT One programme. Some 38 percent of UETP managers were women, with few UETP Directors being female (while most of the clerical staff employed were female of course).

Some 34 per cent of students taking place in the student work placement programme were women.

Only 20% of the post-experience learners on COMETT funded short courses were women.

No meaningful figure of this type could be offered for the open learning packages produced since the UETPs themselves could not determine what proportion of users of such materials were female. As suspected, however, only a handful of activities, other than those taken forward by WITEC, were specifically aimed at women under COMETT One.

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The COMETT Office had evidently not initially reacted to these figures and had allowed them to be published in the consultants' report without any commentary about their significance. However, other pro-feminist agencies in Brussels had taken a dim view of these findings, especially given the scale of the COMETT programme.

I doubt whether any GASAT colleagues would have found these figures in any way surprising. Indeed, given the realities of the situation concerning the degree of under-representation of women in technological studies at higher education level, and even more so in terms of women technologists established in careers, I found the results significantly encouraging. Some interesting inferences can be drawn from the variety of reactions to these statistics.

Firstly, it seems to me that the higher level policy makers and programme designers concerned with initiating and progressing COMETT were unaware of the importance of the gender and technology issues, despite all that we have attempted to do to raise the profile of these issues in Europe. The COMETT Programme is dominated by older male scientists and engineers because of its emphasis on high technology specialisms and the need for funding bids to be judged by narrow 'experts'. Perhaps the seeming unawareness of gender (and ethnic minority) inequalities in technological fields and the potential of COMETT to combat these is therefore not really surprising.

The critical reaction of the 'Women's Lobby' in Brussels while most valuable in generating increasing concern about gender issues in the COMETT office is also worrying. It was evident that many women in the Commission and its agencies had no appreciation at all of the seriousness of the under-representation of women in technical fields in Europe. Doubtless, many of these women, whether politicians or civil servants have humanities and social science backgrounds, with no 'enterprise' experience and no 'feel' for human resource issues in industry or technology. In this context it should be pointed out that many EC training and development programmes, especially those funded via the European Social Fund, aim to support initiatives for the unemployed and disadvantaged of Europe. The figures for involvement of women in these programmes are likely, therefore, to be high since many of the unemployed and disadvantaged are women. COMETT, conversely, is inherently an elitist human resource development programme, since its starting point is with higher education technology students.

An obvious conclusion is that GASAT in Europe, WITEC and the SEFI Working Group on Women in Engineering need to specifically target information and guidance at the women's lobby group in Brussels, which is very sympathetic but perhaps not well informed.

Reflections on the COMETT One Gender Statistics

Since no specific research has been carried out concerning gender issues within the COMETT Programme, any attempts to account for the gender statistics culled from the COMETT One stage can only be speculative.

At first sight, the proportion of Women UETP managers, at 38 per cent seems very encouraging. The UETP managers play in many ways the most important role within the COMETT Programme, since they are generally funded to work in a full time capacity and the UETPs are the main focal points for COMETT developments. However, for the most part the UETP managers are funded via COMETT monies, which are short term, often a year at a time. As a result many posts are very insecure, with one or two year contracts, potentially renewable, being the norm. As such the posts, while involving very interesting, stimulating (if demanding) work are less likely to attract men relative to women, who are more often having to accept insecure jobs.

The figure of 34 per cent of student work placements involving women students is to my mind an encouraging outcome. Even taking account of the higher numbers of women business studies and management students in European universities, most of whom are eligible to take up COMETT placements, the figure of 34 per cent must well exceed the proportion of eligible women students in EC states. The reason why there are more women students proportionately taking up work placements in another state than might have been anticipated may well lie in the language area. In general research has consistently indicated that women technology students have broader capabilities and interests than men technology students. It is therefore likely that women technology students have greater capabilities to speak a foreign language, if not well, at least well enough to contemplate working in the relevant country. Many male technology students have a greater reticence in regard to foreign languages.

The relatively strong involvement of women students in the COMETT programme is certainly good news, both for the women and for their employers, many of whom will never have had a women working as a technologist in the company before. The empowerment and confidence that accrues to women from the experience of working in an enterprise in another EC state at professional level is of course very considerable, not to mention the growth of technical skills and language expertise.

The 20 per cent figure for women on COMETT funded short courses is less impressive, but is still interesting since there is nowhere near that number of women professional technologists at work in Europe. It may be that such women are keen to take up training and updating opportunities in the effort to advance themselves in competition with men. Again, there may be a language dimension since a significant proportion of short course attenders seem to come from outside the countries where the course is held.

Outcome of the Gender Findings

Whatever the true significance of these gender statistics, they have certainly placed the spotlight much more clearly on the need for COMETT to raise its equal opportunities profile. WITEC staff have acted firstly to 'calm the ship' about the significance of the statistics, secondly to counter the predictable but naive attempt to blame WITEC for the 'gender problem' in COMETT, and thirdly to use the chance to gain 'leverage' to get 'positive action' thinking into the COMETT programme concerning women.

The gains to date can be counted as:-

(i) A clear statement concerning equal opportunities within the COMETT Two objectives[3]

(ii) Strong encouragement for WITEC to become a source of both expertise to all the other UETPs on gender issues and a 'propaganda' arm of COMETT in the quest for gender equity in the COMETT programme.

(iii) A much more successful outcome of WITEC's bid for COMETT funding for 1992-93, with monies now available for the first time for distance learning development.

(iv) A raised awareness in Brussels that a large gap exists between high level policies concerning equal opportunities in the Commission and the Parliament, and the actual approach to funding initiatives which are the practical embodiment of those policies, and the realities of Brussels for field workers in the member states. WITEC staff are now in much closer dialogue with a whole variety of agencies in Brussels and associated with the EC parliament which are concerned with equal opportunities. They are being alerted to many complex issues relating to women and technology/enterprise which are not well considered outside 'GASAT' type networks.

Conclusion

WITEC has developed extensive 'Guidelines for Action' aimed at employers, higher education institutions and UETPs concerning progressing the involvement of women in technology. These will doubtless help in the struggle for improvement. However, I believe that given the current recession equal opportunities issues will not be given the priority which is needed without more emphasis from funding agencies such as COMETT. It is only when commitment towards equal opportunities and effectiveness in outcome terms are influencing funding decisions that most higher education institutions and companies will move to prioritise 'women in technology' issues. The contracting and funding power now being held by the Commission needs to be used to much better effect to act as a lever for rapid change. It is not enough to generate special initiatives for women without modifying its approach to equal opportunities for the main funding programmes. The WITEC UETP will continue to wield as much influence as it can within COMETT, and EC programmes more generally.

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ACADEMIC CAREERS OF WOMEN IN UKRAINE

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The last developments in Ukraine, radical economic and societal transformations it is going through have placed the Women's question in a new historical and theoretical context, it has virtually come anew to the fore of public awareness. Women themselves begin to pay much greater attention to the questions, defining their social status, looking for more active role in science and education.
Formally, women are well represented in the staff of institution of higher education and science, although their professional development and academic careers still fall short of their intellectual potential. This persisting women's lagging behind men can be explained by the effect of a set of factors: 1/ inertia factors of universal character; 2/ social; 3/ economic; 4/ historical and political; 5/ demographic;6/ religious; 7/ psychophysiological, etc.
Process of reforms in Ukraine so far has not brought about significant changes in women's standing in higher education and science. Moreover, if the new opportunities has turned out to be mostly token, precarious economic situation seriously impedes women careers in those fields and adversely affects their position in society at large.

Radical transformations in the former Soviet Union affected practically every aspect of political, social and economic life. They called for reconsideration of a host of problems, which were more often than not viewed rather superfluously. One of the most important of them is the role of women in society.

According to the last Census /1989/, women in Ukraine make up 27.8 mln., or 54 per cent of the whole population.

As compared to the past, women's achievements in the field of education and research are obvious. Women considerably outnumber men in the category of specialists with university or college education, employed in economy - they make up 61 per cent of those. Presence of women is especially conspicuous among economists, teachers /75 per cent of their total number/, physicians /60 per cent/, researchers, judges, engineers, agricultural specialists /36-38 per cent/. Women make up about 40 per cent of scientists. Women outnumber men in many scientific research institutes in the field of humanities and social sciences.

In principle it can be stated that women have equal rights with men as far as access to higher education in concerned. However after graduation situation obviously changes for women: their academic careers appear to be much more thorny, than those of men. It looks like the latter can count on the implicit solidarity of the predominantly male establishment of the institutions of higher education and research. The fact that women constitute a great part of the staff in higher school and scientific research institutes can considered an important achievement, although women have, as a rule, a much lower degree of scientific education.

The number and the share of women in all academic positions in Ukraine is about 36-38 per cent. Nowadays, only 13 per cent of all holders of Doctorate degree, and 26 per cent of all holders of Philosophy Doctor degree are women.

Women postgraduates represent more that 50 per cent of all those who engage in research and want to take the first scientific degree, but not all of them will be able to defend their thesis at the end of the course. Not surprisingly, the highest proportion of lectures without scientific degree /about 70 per cent/ is among women. One of the common trends for all the institutions is the small number of women among full professors and academicians - 1 per cent only.

About 70 per cent of the members of Administrative boards of the institutions of higher education and research are women, but decision - making position are occupied only 12 per cent of them. women may be the deans of departments, chiefs of chairs, at most, prorectors or deputy directors but they very rarely occupy positions on the top. The number of women directors and rectors of the institutes and universities in Ukraine could hardly reach 1 per cent mark.

The last figure could be much higher, if the obstacles in the way of women careers in science and education would be counterbalanced by affirmative personnel policy.

Among the main reasons that impede progress in the improvement of socio-economic position of women in Ukraine as a whole and their academic careers as such are the following:

1/ inertia factors of universal character /hypnosis of men's superiority/;

2/ social /peculiarities of women's life-cycle and persisting gender divisions of social roles/;

3/ economic /critical stage of transition/;

4/ historical and political /historical background and the latest changes in the country/;

5/ demographic;

6/ religious;

7/ psychophysiological, etc.

A women is devised by nature to be the weaker sex, while a man -the stronger one, but as to the intellectual abilities

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it's not a nature that has secured for a male the higher rungs of society, but sheer prejudice. According to the universal stereotype of male superiority, a man is considered to be the chief creator of material wealth and a master of life. Regretfully it is a male, who plays the vicious role in hampering women careers both directly, in the way it was mentioned above, and indirectly, by means of skeptical prejudiced attitude towards women's abilities, obsolete stereotypes in the determination of the role and place of women in society and science, neglect of competence and professionalism of women scientists. So in one way or another the men have formed distorted image of a woman. Furthermore women themselves to some extent are hypnotized by the myth of stronger sex superiority. Only few women /14 per cent/, according to the opinion survey, are looking forward to occupy higher position, at their places of work. They think that this is the men's business and only men can cope with such tasks.

Massive involvement of Ukrainian women in production should be considered as an objective reality of today. The number of women among workers employees is about 10.6 mln. or 52 per cent. High rate of women employment in Ukraine, however, is not secured through creation of appropriate working and living conditions, which would enable them to combine with performing family duties. Ukrainian woman spends on the average about 89 hours per week for work, childbearing and other family functions, while a man - 77 hours. The difficulty lies in the fact that men and women still function in different worlds and their roles in family and society at large are very different.

The last developments in Ukraine, radical economic and societal transformations it is going through have placed the Women's question in a new historical and theoretical context, it has virtually come anew to the fore of public awareness. Women themselves began to pay greater attention to the questions, defining their social status, looking for more active role in science and politics.

Responding to this socio-psychological phenomenon Ukrainian Parliament established a special Parliamentary Committee on the position of women, protection of mothers, children and family. New women's societies emerged /Union of Ukrainian Women, Committee of Ukrainian Women, Club of Business Women, "People's Movement - Ukrainian Women", etc./. Both state, and social bodies were expected to foster overcoming the obstacles which hamper participation of women in all fields of social life, science, education, politics, etc. Unfortunately, for the time being, these expectations fell short of realization.

According to recent opinion survey about 50 per cent of women respondents think that radical reforms have brought nothing for them and about 15 per cent think, that they have made it even worse.

One of the key-factors, determining position of women in society is time needed for proper housekeeping. Due to underdevelopment of service sector in Ukraine, efforts made by women for this sake can be termed as excessive.

Deterioration of economic situation has had obviously adverse effect on the position of women in society. The women, taken into consideration their special role in the family as the principle household-"managers", bear major consequences, resulting from reductions in real income due to inflation, underemployment and unemployment. Following universal scenario, Ukrainian women are to be "last hired and first fired", in the period of economic turmoil, caused by transition to market economy. Especially disturbing is the fact, that quite often women do not know their rights and privileges, because of the lack of adequate information, or do not know how to make effective use of them.

So, economic difficulties Ukraine is facing now at the critical stage of transition greatly influence the natural constraints of women careers. Difficulties in economic growth have created new obstacles to women's participation in various fields of science and technology, education and development and, lastly, to their progress towards real equality with men - seriously undercutting previous advances. Women's working world continues to differ from men's in the type of work, the pay, the status and the pattern of entering and leaving the work force.

A very special question is the impact of the emergent Ukrainian statehood on women careers in science and education. Reorganization of the whole state structure in accordance with the tasks and objectives, inherent to the sovereign state, generate huge demand for qualified personnel. This situation, eventually requires, reshaping and expansion of the system of education and scientific research. It can be assumed, that under the circumstances women would find more ample and promising opportunities for pursuing their academic careers. In the meantime, institutions of higher education and research are in precarious condition due to fiscal crisis and general economic instability. At the moment, it is very difficult to predict whether factors fostering women careers in new, independent setting would outweigh traditional impediments, exacerbated by scarcity of financial resources.

Finally, we would like to address international aspect of the problem under consideration. Traditionally women have had less access to international scientific information than man in this country. They have had less chances to participate in international scientific information than man in this country. They have less chances to participate in international scientific meetings, pursue their studies abroad /especially when woman is married and have children/. The situation has been even worse for women-scientists and educators, residing in former Union of Republics, whose possibilities were much more limited in this respect, than for those, employed by "central" institution.

This state of affairs started to change only recently, as women scientists of Ukraine have a chance to voice their own ideas and acquired new opportunities for the establishment of international contacts. These contacts on Women's Studies are in a very early stage of development but they do function and quite successfully. Such cooperation could promote working out a new approach to Women's Studies in countries of the Commonwealth of Independent States and promote more active participation of women in science and education. Importance of discussing common problems and learning from each other's experience seems absolutely unquestionable for women scientists.

Thus all factors mentioned above should be taken into account while working out a scientific concept, recommendations and programme for solving the problems facing women and their academic careers as such. Radical programmes for future action by governments is a matter of principle.

GENDER AND TECHNOLOGY EDUCATION IN EUROPE

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ABSTRACT

Technology plays an essential role in society. Technology has a big impact on the economy.
Thus there is a lot of interest for technology as part of general education. Questions the are: what is technology?, how to develop a curriculum, how to educate technology teachers. The position of (young) women in technology and the education of technology still is less positive as (young) mens' position.
For the coming years we should concentrate on developing a better education of especially technology for girls and young women.
Co-operation in R&D in the field of 'Gender and Technology education' between EC countries and Middle and Eastern Europe countries with the help of EC funds is possible.

TECHNOLOGY EDUCATION

Not so long ago one was used at workshops and at conferences like this GASAT-meeting to have proposals, ideas, discussions

on 'science and technology'. Most of the time then went to science education.

The last ten years there is a growing interest to spend time and attention especially to the education of technology. In the school system of many countries there is a growing interest in technology education.

TECHNOLOGY EDUCATION AS PART OF GENERAL EDUCATION

In 1983 Unesco published a study with this title
'Technology education as part of General Education.
A study based on a survey conducted in 37 countries'.

The report refers to earlier UNESCO pulications:

'An initiation to technology and to the world of work should be an essential component of general education without which this education is incomplete' (first sentence of Paragraph 19 of Part IV of the Unesco International Recommendations; 1974).

This definition is given in 1978:

'technical and vocational aspects of general education (initiation technique et professionnelle dans l'enseignement général)
This term refers to those components of the general education curriculum which introduce pupils to the elements of technology, in order to acquaint them with the role of technology in contemporary life and permit them to develop basic practical skills in the manipulation of simple tools and materials. This element of general education is also designed for information and guidance purposes for eventual educational and occupational choices, but it is not intended to prepare young people for a specific occupation. It is usually offered at the lower secondary level, or may continue to be offered throughout secondary education' (Terminology of technical and vocational education, Unesco, 1978).

The 1983 study based on a survey in 37 countries shows that objectives of introducing technology education into general education curricula are:

'-to prepare the student for making useful contributions to home, school and community life,
-to develop in students a sense of dignity of labour,
-to develop in students a sense of pride in achievement through manual work,
-(...), (...)' (Technology education as part of general education, Unesco, 1983, p. 7)

and also:

'major aims of technology education: to develop in all students a general understanding and appreciation of and sympathy for scientific and technological development; to enable all students to become involved in at least some parts of the technological design process' (o.c., p. 8).
That part of the publication ends with:
'each person should be trained to make a useful contribution to society and to the economy' (o.c. p. 10).

TEN YEARS LATER

Now, ten years after the cited Unesco publication on 'Technology aspart of general education' there still is an ongoing discussion to have technology also as an element of general education. Just to mention only one example: in the Netherlands this summer the parliament took the decision to have technology education as part of general education for all 12 to 15 year olds.

In all countries technology has an important place in vocational education. Think of schools with programs and curricula in the field of electrotechnology, construction, chemico-technology etcetera. All countries have universities and schools on several levels for engineers and for technicians.
This paper 'Gender and technology education in Europe' deals with the education of technology as part of general education.

Technology plays an essential role in society; this role even is bigger than only ten years ago.
Thus the interest of having for technology a place in education, in general education, also even is bigger.
There still are discussions on the issue
-what is technology?
-what do you mean by technology as part of general education?
and on questions like
-the curriculum development,
-the investment of money,
-the education of technology teachers.
A lot of time and attention have been spent to the question 'has technology to be a subject on its own like math, like physics, like ..., or can it be integrated in e.g. the natural sciences. In this context one can observe that a discussion like this deals with the lower part of secondary education, the education of about 12 to 15 year olds, and is spreading to the 6 to 12 year old pupils.
Which arguments mostly are used when people ask attention for 'general' technology?
This is the answer:
-technology plays an essential role in society,
-in this one cannot afford to be technological illiterate,

-there is a still growing need for technicians and engineers,
-a modern society/democracy needs technologically informed citizens.

More pupils and students should be influenced to make a choice in the field of technology.

AN INTERNATIONAL MOVEMENT IN THE DEVELOPMENT OF TECHNOLOGY EDUCATION

One can observe an international movement in the development of the education of technology.

Why?

The technological developments of the last decades have changed the personal and the societal lifes of all of us. These developments are going on and on.

The technological developments also have played and still are playing a big role also in the political developments.

Technology has a big impact on the economy.

So from many sides there are influences to have technology as an element of education.

This movement is not just something of one or another country; this strong development of technology education has an international character.

Questions, as mentioned before, like
-what is technology?
-the curriculum development,
-the education of technology teachers,
are the same questions in many countries.

So, as one can see, there is an enormous growth, if not an explosion, of international meetings to discuss technology education.

THE GENDER ASPECT IN TECHNOLOGY EDUCATION

The position of (young) women in technology and in the education of technology still is less positive as (young) mens' position.

As for working in the field of technology:
-less women than men work in this field,
-the average salary of women is less than mens' salary.

As for the education of technology:
-the average attitude of female pupils and students towards technology is less positive than boys' attitude;
girls and young women have a weaker idea of what technology is,
they don't like technology as much as boys and young men do, they don't think technology is of interest as much as boys and young men do.

Now suppose that by some reason girls like more than boys to play flute, that girls better can play flute than boys do; and that boys by some reason are better violin players. It should be interesting to observe it. But it should not have such big social consequences.

It is another situation when one looks at differences in the interest in and the attitude towards technology. For diplomas with more or less (high) technology in it at the end of the school career in general have big consequences in finding good and promising jobs. In the Netherlands e.g. there are big differences in unemployement half a year after leaving school with a diploma between those who have got a technological schooling and those who have not.

INTERNATIONAL CO-OPERATION IN DEVELOPING BETTER EDUCATION OF TECHNOLOGY FOR YOUNG WOMEN

The series of international GASAT conferences since 1981 has contributed to the development of better science and technology education for girls and (young) women.

For the coming years we should concentrate on developing a better education of especially technology for girls and young women.

Do we know how to organize such a better technology edu cation?

Yes and no.

We know some of the reasons of the weak position of girls and young women in technology education:

-technology still has a male image,

-parents and peers still don't expect girls and young women to go into technology,

-teachers still don't see there is a problem,

-employers still don't expect (young) women to be as success-ful as (young) men in technology.

We know some of the solutions:

-to make parents, teachers, pupils and students themselves, employers aware there still is a problem,

-to operate in a wide field of actions: curriculum development, teacher training, information, 'frappez toujours'.

But we have to develop better and more successful ways. International co-operation can be a big help.

INTERNATIONAL CO-OPERATION IN A CHANGING EUROPE

When one thinks of international co-operation in a changing Europe one can have two developments in mind:

-the fast growing development of the European Community (EC),

-the also fast growing co-operation of the EC with other European countries; with the Nordic countries, with Switzerland, but also with countries in Middle and Eastern Europe.

For rather some years already the EC, with Brussels as central administration, places several kinds of funds at the disposal of universities and institutions for higher educaton, and of students to exchange ideas, for mutual visits for some days, weeks, months.

The last years the EC also administers several kinds of

funds for mutual co-operation between EC-countries and countries of Middle and Eastern Europe.
Being involved in a so-called TEMPUS project (in the field of modernizing the physics curriculum in first years of universities and last years of pre-university schools, with participants of the Netherlands, Germany, Poland, Czechoslovakya, Hungary) I experience how helpful such a co-operation is for all participants, how important also for students, growing up in this fast changing continent with such a long history.
What I like to plead for is to look at the possibilities that now are present to start projects to promote a better technology education for girls and young women with EC funds; projects to exchange outcomes of research and development in the topic 'Gender and technology education'.

WHAT POSSIBILITIES ARE PRESENT WITH EC-FUNDS?
When one looks at possibilities with EC funds, one can look at two ways:
-those possible forms of co-operation within EC countries. These possibilities do exist already a number of years. There are several kinds of funds;
-those possible forms of co-operation between EC countries and Middle and Eastern Europe countries.
Here I am looking at the last: forms of co-operation between EC countries and Middle and Eastern Europe countries.

Co-operation between EC countries and Middle and Eastern Europe countries with the help of EC funds last years is possible. There are several kinds of funds, and so of projects.

What is necessary to set up such a co-operation is the investment of a certain time, knowing one is not sure if that investment really will be succesful. (But this is normal when wrting proposals likes these!)

What one also has to be aware of is to read procedures etcetera carefully. There are possibilities, and there is rather a lot of these, but there even are more applicants.

It has no sense to invest time without being careful in what possibilities are, and what the procedures are.

Here I like to mention just two new activities of the Programme Human Capital and Mobility.

The description of these two examples is given on basis of information of July 1992.

The data are taken from an information package on 'Human capital and mobility 1992 - 1994', published by the Commission of the European Communities, Directorate General XII Science, Research and Development.

In the Programme Human Capital and Mobility four activities will be carried out:

1. fellowships, 2. networks, 3. large-scale facilities, 4. Euroconferences.

In the following I cite parts of the information package, especially dealing with the activities 'networks' and 'Euroconferences'.

On networks:

'The development of research networks linking several teams or laboratories with complementary capacity will be pursued with a view to the achievement of the objectives of the Community's research and technological development policy, consolidating and complementing the structuring effects of thematic programmes, especially in emerging areas when the novelty or complexity of a research area so requires. (...)

As a general rule, scientific and technical cooperation networks should consist of at least five laboratories or teams in at least three Community countries. These networks will undertake joint research and development in one or more research areas.
On Euroconferences:
'The development of a system of R&D Euroconferences will strengthen the cohesion of the Community by allowing young researchers to have contact with and benefit form a high level of erpertise in a particular science and technology domain, through active participation in significant high-level meetings.(...)
Organizers of Euroconferences may be scientific organizations, scientific associations or learned societies.'

ACTIVITIES IN R&D OF "GENDER AND TECHNOLOGY EDUCATION"
In all countries there (still) is a need of R&D in the field of "Gender and Technology education".
International cooperation can be of benefit.
EC funds can help to have more international cooperation in the R&D of "Gender and Technology education".

EXCURSION:
HOUSE OF THE FUTURE

VISITING THE FUTURE

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Introduction

The Dutch house of the future can be regarded as a place were new technologies in forms of materials and products are exposed to a larger public. Nevertheless the house is presented as a kind of museum in which future life can be experienced. A special ticket admits to this unique experience.

This house of the future is a tempting object of study for feminists who have studied the relations between technological and social developments . After all, the house is more then a host of new products and materials in a designed context. At the same time it is a location where visions about how people are, how they (ought to) live and behave in the future, are produced.

In much feminist research technological development is considered a process that results in products which inevitably effect (future) life of men and women. Women appear as relatively powerless victims of the introduction of technology in society: until now they seem to lack the power to make sure that the positions of men and women are equal (or at least less unequal) in the future.

In my opinion the development of technologies is a never ending process. Technologies are part of an ever changing society. As a consequence the products and their impacts are permanently made and remade. Presuppositions about life and behaviour of future users which are built in products and in the stories about the way they should be used, are permanently confronted with the way people actually (want to) live and behave. The outcomes of these confrontations cannot be predicted beforehand. Although it is often neglected, men and women (can) play a significant role in determining the effects of technological products on society.

I shall describe the Dutch House of the Future as one of the locations where confrontations between the presuppositions built in technologies and their stories, and the opinions and actual behaviour of people who are supposed to be future users take place.

My experiences as a visitor will illustrate that the visitors opinions and behaviour are considered important.

The power of the supposed users, their and other stories should also be considered important by those who want to contribute to changes in the way technological developments effect society.

An extended laboratory

I consider the house of the future as more than just a museum where visitors can see the way houses in the future might look like. It is at the same time a place where stories about

future life and future people are made and remade.
On this location a confrontation between the presuppositions about future users, their needs and behaviour and a group of visitors takes place. In this respect the house is an extended industrial laboratory where important experiments occur. Objects of experiments are visitors but also the products in the house.
Of course the opinions of those who were involved in developing the house of the future are prominently present in (among other things) forms of products. Yet, although they may not be aware of it, the visitors play an important role in these experiments.

Developing technology is a social activity

It is almost impossible for visitors or researchers to grasp every participators'/ developers' idea about people and life in the future. Some funding companies for example may have had clear visions of this house as a marketing spot, a place to present their products as things people are in need for, hoping to find an outlet. Perhaps others used this project merely to establish or confirm the idea that their companies belong to a select group of 'future creators', whatever that future may be. It also cannot be excluded that some of those who were involved did their jobs without having the slightest notion of the way in which their contributions might effect life in the future.

Whatever the opinions and motives to participate in this project may have been, every contributor has had in his or her mind ideas concerning the way people live, behave and make use of their products in the future. The process of developing, designing and producing materials and products for the house of the future can therefore be characterized as technical and social at the same time.
Ideas of how people (ought to) live and behave in the future and of what is important and what isn't are developed during this process. These ideas are (partially) built in products and are a fundamental part of the house of the future.
Whether or not and especially how this house of the future

and the social ideas it embodies shall have effects on future life and behaviour, depends largely on the extent to which people share or accept the underlying social assumptions, i.e. (are willing to) buy and use the products as they are 'supposed to.

Motivating visitors to become future people

During a visit to the house of the future visitors can be convinced of the need to change their opinions, needs, life-styles and behaviour in order to become 'the people of the future'. The confrontation between the visitors' conceptions about the future and the ideas concerning the future that are built in the house, is well prepared. Everything possible seems to be done to make visitors believe that they would want to live in this house, with these products, not regarding the way they actually live and the (limited) possibilities they have. A problem is that the visitors are probably not a homogeneous group at all. They can be very young (and accompanied by their parents) in middle age or old, male and female, scholars, friends or families. They may be very well educated or unskilled/ not at all. They are housekeepers, administrators, secretaries, architects or managers or jobless. They come from all parts of the Netherlands, but the house of the future is also visited by foreigners.

They certainly come to the house for very different and probably sometimes contradictory reasons.

Some people come as experts in materials and products used in the house, others just want to have a nice day with their family while visiting an attraction.

Finally, the visitors, their knowledge and expectations change through the years. What they recognize as futuristic will differ as time goes by.

What efforts are made to create future users?

Video power

The mere existence of the house and the fact that people can walk through, see and touch The House of the Future for a while, may already motivate people to change and become 'future people'. But much more is done to stimulate people to think and behave as they are supposed to.

Before entering the house of the future people are guided through an attraction park to the house. Waiting on a small bridge that leads to the entrance they hear a short story about the house voiced by loudspeakers.

After a while they can enter a room that appears to be not the house but a videoroom. In this room the visitors are without guidance. Suddenly the curtains fall and a screen rises. Soon after that a video is shown in which several elements of the house of the future are introduced as 'innovative', 'miraculous' and 'futuristic'. One of the key messages is that the house is very comfortable to live and work in. Besides that everything one might want to do can be done efficiently in this house: the house is time- and in the (very) long run money-saving. The prices of the house and the products it contains are not mentioned. Money seems not important at all. Last but not least: the house is presented as a cosy home where fantastic birthday-parties can take place.

Then all at once, the curtains rise and a guide enters the room. By that time visitors are prepared to enter a 'new world' filled with miracles and promises. They are told again and again that the house they are going to visit is extremely 'new', 'high-tech' and 'futuristic'. As a consequence it may seem almost impossible for visitors to enter the house with their daily life, opinions and behaviour strong in mind. They are (although not straigthforwardly) asked to neglect the present and to experience this house as if they are already future people.

Visiting the future

The guide accompanies the visitors to a huge building that is to be entered (again) by a kind of bridge. This appears to be The House people have come for. In an almost empty corridor the guide tells his/her first story in which safety is the key word. One of the walls appear to contain a panel with lots of switches and slides. It turns out to be the central information unit and is called Ralph. Ralph registrates whether anyone is in the house, who it is, where he or she is at any moment. Ralph recognizes householdmembers and relatives by reading their identity cards. As a consequence he knows when unwanted visitors (burglars and others) are inside. He is aware which equipment is turned on and off. Ralph registrates open fire immediately and warns the police and firemen if necessary. Ralph knows everything that is going on in the house. He is a personal guard, and private detective with characteristics of a god: invisible but always present.

The guide, whose movements, explanations and time turn out to be strictly controlled by Ralph, stresses the safety of this house. Daily life of the visitors enters the story as a world filled with burglars dangers and unpredictable events.

This house, with Ralph, represents the opposite: it is a private world in which safety is guaranteed.

Then the house is shown room by room. It appears to consist of a huge living, an open kitchen and on the first floor: a bath, two bedrooms (one for two persons and a smaller one for one person), a reading-corner and three work-units. Apart from the kitchen, every location where activities take place is marked by design: they have the shape of an island.

Whether or not the unusual design impresses the visitors, it is only slightly mentioned. During the visit the guide often refers to the pictures visitors saw in the video-room. This seems to be done to illustrate the function of the equipment when the time is too short to demonstrate everything. Central in the guide's stories is the presence, function and comfort of in most cases electronic equipment.

The living for example is dominated by television. The island is surrounded by televisions. Four screens immediately attract the visitors attention. Besides that the living is filled with modern furniture and well designed music-devices. The guide tells the audience that it is possible to watch four television programmes at the very same time. Future people are liberated from arguments about which channel to choose! Besides that, there is plenty room to sit or walk around for everyone who wants to do something else.

There are for example music-devices which offer the highest quality, something consumers have always dreamt of.

After demonstrating several products the guide starts walking to the kitchen. This room is small and compact. It contains all that is necessary and even 'hidden' refrigerators and a computer that can among other things be used as a cookery book. Technological developments made it possible and are used to miniaturize the kitchen in an astonishing way. Safety, comfort and efficiency are the key words in the kitchen story. Preparing meals in this unit saves time and energy. It is suggested that this means that it is a pleasure as well.

The bedrooms are the next rooms to be visited. There are beds, televisions and wardrobes, but they are mainly empty. The single bedroom also contains a desk with a music-device and a computer. There are some toys (cars) on the floor. During a short story it becomes clear that the inhabitants of this future house are a couple and their son. In their bedrooms they watch television, listen to music or are asleep. If the boy's music is not appreciated by his parents, they can turn it off by pressing a button. Their rest is guaranteed.

The work-unit, containing three desks with built-in computers, affords the couple to work while they are at home. They can contact their offices and collegues by computer and are liberated from travelling in mornings and evenings.
Of course this implies a decrease of air pollution and more comfort for those who are now used to go to their offices at peak hours.

The guide only points at the reading-island. There are several book-shelves, two chairs and a small table and obviously there is no need to spent words on this unit.

Afterwards there is (again limited) time for visitors to have a closer look at, use or play with what is exposed. During

this period the guide has left the building.
Yet the visitors are not alone. They are surrounded by the words, sounds and pictures they met before. They are also not alone because everything can be monitored.

Confrontations and conflicts

Although the visitors are waylayed with information in forms of pictures, products and stories they are never asked to comment on what they see, hear and experience. Words like 'extraordinary', 'futuristic', 'new' and 'high-tech', all defined as the opposite of what is common in the present, attach their minds. The message seems to be that they are experiencing the future although the future is not (/never) there. This has nothing in common with daily life.
However, although the visit seems strictly controlled, the visitors' behaviour may differ from what is expected. They can express other needs or make clear that they would not prefer to, or be able to live in this future. At these moments the confrontation between the presuppositions about future users and the visitors becomes perceptible.
During my visit someone noticed as soon as she entered the house that the corridor was a strange place to put a washing-machine in. This was followed by the question where the clothes-lines were or perhaps another machine to dry the wet clothes. The guide had no answer to this, exept that there was another room in the third floor which could not be visited, where probably clothes-lines were. Immediately the guide switched to another subject.
Some visitors stated that they disliked the furniture. The guide responded that peoples' preferences differ, but that this furniture was designed by a famous designer, who works with the newest materials and forms. A hidden message in this may be that the furniture is futuristic in the sense of different from what is usual and as a consequence it takes time for people to see and recognize its qualities.
Several visitors showed their disapproval in the kitchen. There were complaints about the fact that small people were not able to reach the cupboards and that preparing meals in this kitchen with more than one person was impossible which

ment a reduction of the social activities that can take place in this unit. The safety and comfortability of the kitchen was questioned thorougnaly. The guide avoided again any argument and told a story about the safety of the stove and the ingenuity of the design. It might not be the best for everyone, but revolutionary it was!

This game between the guide and the visitors took place several times. At the end a majority of visitors was annoyed when critical remarks were made and assisted the guide with their interruptions.

During the time people could have a closer look at the house without guidance several visitors questioned the quality of the house for a longer while. Only a few visitors started 'playing' with the computers or other products. As soon as the guide had left the building, the present, that is the visitors' daily life returned into this future house. In this respect the visitors resisted the pressure to think and behave as if they already were future people. They concluded that this house was in many respects not as miraculous or revolutionary as the guide had told and the video had shown. The messages were only partially accepted. It was for example impossible to think of the house as a home for someone who prefers to live on his/her own, or for people who would like to share their house with other families/ adults. The developers failed to recognize the very different ways people live. They also failed to acknowledge the need for other products for instance a device to clean the house without hard efforts. The smallness of the kitchen and the fact that the washing machine was put in an empty corridor far from any clothes-line was viewed as evidence for the unfamiliarity with daily life of the people who were involved in the development of this house.

Does it matter?

The guide's reaction makes it seem as if the critical remarks from the visitors are not appreciated and are considered of no importance. But if a majority of visitors neglects a product or makes clear that a product is regarded to be of no use, there is a chance that the presupposed future users will never exist. At least several visitors I observed were not eager to become future people.

There is some evidence that the visitors' opinions count. As a matter of fact, the house continuously changes. Every year the colours are changed, new furniture is carried inside and new products are put in the house. Along with these changes, new stories enter the house of the future. Even the future can get old and has to change at the same pace as the present. Futuristic products can lose their futuristic quality through the years and have to be updated or replaced by others.

Recently solar-panels are installed and efforts are made to built a system to heat the water with solar energy. In the stories the word environment appears as something to take care of. It cannot be excluded that the fact that discussions about the waste of energy and pollution of the environment are part of everyone's daily life, may have contributed to this development. Other hot topics in society may contribute to the development of alternative products and a new design of the future. Creating hot topics and the spreading of new stories about present and future may be essential also for feminist approaches to enter (the house of) the future.

A HOUSE TO LIVE IN ?
ideas about the house of the future and the use of domestic technologies

Annemarie van de Vusse

Section Women and Technology,
Delft University of Technology
The Netherlands

WORKSHOP

We would like to run a workshop about designing technology for (future) houses.
Which social values and opinions can be recognized in the construction of the (dutch) "House of the Future"? I.e. which opinions about environment (pollution), control and safety, communication, work (paid and unpaid) are underlying the construction?

We'll give a review of the development of technologies which are used in the construction of houses; what are the intentions and the underlying assumptions?
Most technologies were not developed for use in individual households or to solve problems connected with domestic life. They were initially developed for use on a large scale in other i.e. industrial contexts.
Visiting the "House of the Future" you'll find the products of this development: i.e. in every room there are monitors: these can be useful for controlling chemical processes, but are they necessary for looking after children?

We would like to discuss the restrictions and possibilities: how are people supposed to live in the future; what are people supposed (not) to do and (not) to prefer?
What are the effects of these technologies for everyday life and for the allocation of everyday tasks, such as cleaning, cooking and caring?

INTRODUCTION

Vacuum cleaner, washing machine, furnace, refrigerator: great helps for nearly all households in the Netherlands nowadays. Electric (and gas) appliances were introduced instead of the traditional helps, such as servant-girls and charwomen.

The mechanisation of the housework [1] has got under way especially after the Second World War. Necessary therefore were the introduction to the market of electric appliances, possible after the development of smaller and cheaper electromotors and the connection of houses to the electricity network.

Table
Distribution percentage of household appliances in the Netherlands
(Van Otterloo, 1988)

equipments	1947	1964	1984
gascooker	10	41	78
electric cooker	7	9	17
toaster	5	22	70
grill	-	1	34
mixer	1	32	73
refrigerator	2	40	86
vacuum cleaner	53	96	97
washing machine	14	75	95

At this moment we are entering computerisation of housework, which means the introduction and usage of information technology for activities in and around the house. In the "House of the Future" one can see how designers and architects have represented their idea of a house in the era of information technology.

---

[1] With mechanization of the housework is meant that housework, till then done by hand, changes because of the introduction of (electric) machinery in the home.

AIM

Of the different tasks in the household I want to examine:

- how the technological innovations developed;
- what effects are caused by introduction of these technologies on quantity and quality of housework,
- in what way the allocation of domestic tasks is influenced;

I'll do that for the following tasks:

- food preparation,
- cleaning, of the house as well as the clothing,
- taking care of house and family,
- relaxation.

A house is not only a place where housework is done, but it is also important as a place where the members of the household can relax in a private atmosphere. Also on this field computerisation has had its effects.
I'll use the "House of the Future" as a realized illustration for tracing the ideas and values of the designers.

Tracing the development of new equipments, one can look to the side of demand as well as to the side of supply. Technology push means, that by a certain progress in a technological field there is a search for applications. The realisation of the necessary infrastructure is stimulated and the market is made ready for the sale of products. Market pull means, that the demand of the market determines what kind of technology is developed.

A technological appliance is not a mere product, but it completes a technological pathway, in which a social network is constructed involving suppliers as well as users. One has to look not only at the new product or the new service, but at the whole system of coherent innovations by fabrication, distribution, complementary services, regulators and consumers.
An appliance is bought in a certain market situation and can have consequences for activities until then. Work can made less heavier, but simplified; certain tasks can be cut off, while new tasks are introduced; the content of work will change and herewith, eventually also the allocation of tasks - activities that men and women carry out in households.

FOOD PREPARATION

Preparing food includes shopping, cooking and washing dishes. Cooking is generally seen as a creative process, as one of the nicest duties of domestic work.
Before the introduction of gas/electric stoves one cooked on wood; a bowl above the fireplace, later on replaced by a furnace (on wood). After the connection to the electricity or gas network one didn't need to saw or to carry wood anymore, only turning on the button was sufficient for heating the hot plate. Ruth Schwartz Cowan (1983) has shown that these changes in cooking process have resulted in less work for men - sawing and carrying wood -, but in more work for women - no longer cooking one-pot-meals, but preparing three-course-menus.

Time men spend on **shopping**,is half an hour a day; women need a quarter a day more (CBS: Time-spending of the dutch people/De tijdsbesteding van de Nederlandse bevolking; Kerncijfers, 1987). In the future this activity can be replaced by teleshopping. In the "House of the Future" one can select and order his or her purchases with the use of a computer, named Joyce (a woman?). But there is no system for delivery, which raises the question whether much time will be saved with daily shopping. More likely time can be saved in selecting and choosing big and expensive things such as furniture which is now mostly done by men and women together.

For improvement of quality, **cooking** needs a lot of attention: fresh food, diversification and balance of nutrition; an electronic recipebook for the right steps; furnace and hot plates can be turned on and off at the right moments.

Such an computerisation of the cooking process can lead to a deskilling of the cook - knowledge of home-made soups and sniffs is taken over by the computer; but it can also result in a greater variation of the prepared meals (Miles, 1988).

The introduction of the microwave oven, developed for quick heating of dried meals during space travel (Wajcman, 1991), has resulted in changed eating manners. Special products for use in a microwave oven like meals and bowls have been developed. The need for family meals has come in disuse by the microwave oven, because now meals can be prepared for every individual needs.

Ergonomics was no major issue in the design of the "House of the Future": the sink unit i.e. can not be transposed in height, certain shelves can be poorly reached. Fire safety is more important in the designs, what gives the choice of electric cooking.

For **washing the dishes** one can use the automatic dishwasher, as long as the dishes are not too delicate. Especially dishwashers have given more free time to men, because their help in washing dishes is no longer needed.

Overseeing this development the computerisation will, above all, result in an increase of the quality of the food preparation. A decrease of the time spent on food preparation is hardly expected. There is little attention for working conditions, as well as work allocation.

CLEANING

Women spend about four hours a day on housework, cooking, cleaning, washing and sewing, while men only need an hour (CBS, De tijdsbesteding van de Nederlandse bevolking; Kerncijfers, 1987).

Washing clothes includes collecting and selecting laundry, putting it into the washing-machine, choosing the washing program, taking laundry out after washing for drying (in the machine or elsewhere) and at last folding, ironing and clear away clean clothes.
Washing is a rather heavy work, because one has to carry loads of laundry. In the "House of the Future" there is little considerationof the relief of work, ergonomics of the washing-process. On the contrary, one has to carry loads of laundry from one floor to the other, because the different steps of the process are situated in different places.

New innovations are seldom found in the washing process. The washing machine and spin-drier are developed for industrial use, but were lateron adapted for domestic use. Based on the needs of the house-worker is the design of a house and the development of a machine relieving the tough

jobs. Image a machine where side the laundry is put into, and coming out after a while at the other side, clean, ironed and folded.
Relief of these activities can rather be expected from the development and use of new materials that are dirt-repellent and iron-free.

Cleaning the house gets its attention in the "House of the Future". The windows are provided with a dirt-repellent layer.
Dusting the house is possible with a vacuum-cleaner of which the power can be adapted to the amount of dirt and which gives an indication for a full dust-bag.
In some houses nowadays central sucking-systems are realised, so one can put a hose-pipe at certain places in the wall for dusting.
But also in this case it is a question of technology push - keeping rooms dust-free is necessary for certain production processes. If the line of approach had been the need of the worker, always complaining about cleaning and dusting as dirty, heavy and never-finishing work, then a self-cleaning house would have been designed. Frances GABe has designed a house that cleans itself everyday with a waterspray (1983, in: Zimmerman.J. (ed.) The technological woman (1983)).

CARING

Partly caring has to do with **the regulation of different functions** in the house. In the "House of the Future" a central computersystem, named Ralph, regulates the different functions of the house. When observing smoke he calls the fire-brigade, he looks after the consumption of energy

and water, he takes care of the temperature, and he automatically switches the lights on and off. If someone wants to enter the House, this person needs a card, and Ralph registrates the incoming and outgoing persons.
In this design ideas about safety and control are shining through. These ideas are necessary when one has to control productionprocesses in the chemical industry; but whether they serve the caring tasks in the household?

Taking care means also **looking after the children**. Contact between different floors in the "House of the Future" are intermediate by house-videophone. On the screen one can follow all the activities of the children. Nevertheless isn't it perhaps more convenient for the mother or the father to take a look in the room to see whether the children are already asleep?

Interactive working with the computer is expected for the future (Miles, 1988). One will counsel the computer i.e. in educational and health problems. Now this is a task for the family doctor. By changing it into a domestic task it means a aggrevation for the house-, in most cases, -wife. However in this way she can improve the quality of caring.

Personal contacts, which are very important in the household, are subordinated to the idea of controlling and dominating unsafe situations in the house as good as possible.

RELAXATION

The habitants of the "House of the Future" will read a book once in a while, but most of the time they will seek

their relaxation behind the computer, playing video-games and looking at video-longplays. Recreation will become more individualised.
Experience with the personal computer at home shows that mostly men use it actively for games and recreation, while women look more for its usefullness.

The house as a safe place for all members of the household: especially this thought has been an important impulse for the design of the "smart house". Incoming control with cards and camera's is based on military technology, developed as a solution for guarding strategic objects. The house as protected fortress against a hostile world denies the violence between the householdmembers, mostly women as victims.

CONCLUSION

Examining the innovations in domestic technology one notices that a lot of products are adaptations of machinery which have initially been developed for industrial use. Individual households showed to be a good market. In this development one must speak of a technology push rather than of market pull - the needs of the housewives haven't played an important role in the development of new domestic products.
In the design of the "House of the Future" safety is the leading thought. This means safety of processes inside the house as well as protection against a hostile world outside the house.
Distance control and interactive use of the computer can take the place of personal contacts and personal presence.
Computerisation of different processes in households can

lead to an increasement of the quality of work, however a relief of heavy and boring work is hardly to expected. Although, computerisation can lead to an allocation of domestic tasks. When the division between non-routine tasks, now mostly done by men with computers as high-tec instruments and routine tasks, carried out by women using computers as utensils, fades, an interchange and allocation of tasks will be easier.

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Eindhoven University of Technology

GENDER AND SCIENCE AND TECHNOLOGY

GASAT

October 25-29 1992

PROCEEDINGS

Vol. III

Ten years GASAT activities in a changing Europe

EAST AND WEST EUROPEAN CONFERENCE

SE 054 179

Ten years GASAT activities in a changing Europe

PROCEEDINGS
of the conference October 25-29 1992

Edited by

Marijke van Vonderen
Oda Weyers

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PREFACE AND ACKNOWLEDGMENTS

This book contains the *Proceedings* of the third European GASAT conference, held in October 1992 in Geldrop, near Eindhoven, The Netherlands. Main objective of the conference was to share and discuss developments in a changing Europe and their effect on participation of women in science and technology.

The accepted papers of the conference have been published in two Volumes of Contributions. This, third, volume contains the text of the four keynotes and reports of the papersessions, workshops, home groups, postersessions and the East-West Forum.

Many people contributed to the success of this conference. We are thankful to the planning committee, the Dutch advisory board and the International advisory board for their suggestions and cooperation. Much appreciation is expressed to the sponsors. Without initial financial support from the Ministry of Education and the Eindhoven University of Technology we could not have started the organization.

Organizing a conference is a lot of work, but we received often unexpected support. Without trying to be exhaustive, we want to acknowledge warmly Annelies Vincent for her decision to appoint Oda Weyers in the period that Marja Brand was unable to fulfill her task; Tineke Tolsma for her expert assistance in all kinds of secretarial jobs; Fabiola Bukkems for her contributions to the financial part of the organization; and last but not least there was Leo Balmer: we owe him special acknowledgement for his invaluable contribution to the smooth running of the conference.

Marijke van Vonderen
Oda Weyers

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INTRODUCTION

The GASAT (Gender and Science and Technology) Association is concerned with issues arising from interactions between gender and science and technology. Its objectives are:

- to encourage research into all aspects of gender differentiation in science and technology education and employment;
- to foster gender equity in science and technology, in education and in the workplace;
- to facilitate the entry of women into employment in the fields of science and technology, and their progress within such employment;
- to foster socially responsible and gender-inclusive science and technology;
- to provide a forum for dissemination and discussion of research findings and experiences of those working in the field;
- to provide a support network for those working towards the objectives outlined above.

In the past twelve years every two years a GASAT conference has been organized and encouraged worldwide participation. In between three times a European GASAT was held: in Denmark (1986), in Sweden (1990) and in 1992 by the women's groups of the Eindhoven University of Technology in The Netherlands.

This book is the third volume of an edited series associated with the third European GASAT conference, held in the Golden Tulip Hotel at Geldrop, The Netherlands, in October 1992. Volumes I en II, published prior to the conference, contain the conference contributions. This volume contains the proceedings.

The theme of the conference was *Ten years GASAT activities in a changing Europe* and we called for contributions from Western European researchers and from Eastern colleagues as well.

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Following the tradition of GASAT-conferences, papers formally accepted as contributions to the conference, were distributed in advance. The two volumes were posted to all participants except those living in Eastern Europe since we expected a postage delay to Eastern European countries. Unfortunately many participants received the books just a few days before the conference, because much time was lost between delivery and postage of the books. At the start of the conference, however, all participants were in the possession of Volumes I and II of the Contributions.

THE PARTICIPANTS

The conference was attended by 87 participants from 19 countries. Of these 74 people attended for all or almost all days and 11 people attended the Visitors' Day on Monday 26 October and two visiors participated on Tuesday 27 October 1992.

We were granted financial support to cover expenditures of twelve researchers from Eastern Europe. Although for two of them the guarantee of financial assistance came too late to get their visa in time, with help from others there were 12 colleagues from Mid and Eastern Europe at the conference indeed.

The conference language was English. This might have been a barrier for colleagues from France and Spain to participate. On the other hand, the last week of October was a problem for University-people from countries where the Academic year just had started. Neither the language nor the date stopped 87 people to come to Geldrop near Eindhoven and we were very happy to welcome them on Sunday afternoon October 25th, 1992, before dinner.

PROGRAMME GASAT CONFERENCE 25-29 OCTOBER 1992

Eindhoven University of Technology

Sunday October 25th	Time	Monday October 26th	Tuesday October 27th	Wednesday October 28th	Thursday October 29th
13.00-16.00 registration		*visitorsday*		*university day*	
	07.00	breakfast	breakfast	breakfast	breakfast
	08.30	briefing	briefing	briefing	briefing
	09.00	papers: share & discuss I.1 2 3	papers: share & discuss II.7 8 9	university speech keynote [3]	homegroup reflect and evaluate
	10.30	coffee break	coffee break	coffee break	coffee break
	11.00	papers: share & discuss I.4 5 6	papers: share & discuss III.10 11 IV.12	keynote [4]	plenary reporting of the homegroups
	12.00			reception & lunch	
	12.30	lunch & displays	lunch & displays	excursion house of the future	farewell lunch
briefing	14.00	keynote [2]	Forum "East and West"		
	15.00	tea in home group	tea in home group		
	16.00	workshops w1 w2 w3	posters p1 p2 p3 p4 p5		
opening	17.00	free	free	university reception	
dinner	18.00	dinner	dinner		
	19.30	free	free	concert dinner	
keynote [1]	20.00	workshops w5 w6 w7	workshops w9 w10 w11 w12		
meeting your homegroup	21.00	free	free		

Keynotes: [1] Jacquelynne Eccles
[2] Else Barth
[3] Jan Harding
[4] Elin Kvande

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THE PROGRAMME

On Sunday afternoon the conference was opened by Ilja Mottier, chair of the Interim Board of the GASAT Association. The programme included a number of activities: keynote addresses and the East-West Forum, papersessions, poster presentations, workshops and round tables, an excursion to the House of the Future, and home group meetings. A copy of the overview of the programme is included.

The plenary sessions

On Sunday Ilja Mottier's opening address was followed by dinner and after that Jacquelynne Eccles (Professor of Psychology, University of Michigan, Ann Arbor, U.S.A.) read the first keynote lecture on *Bringing young women to math and science.* After a short discussion the participants split up in their home groups for further discussion and evaluations.

Each morning of the conference, after breakfast all participants convened for a briefing about conference organization.

On Monday, 2 pm, the second keynote address was read by Else Barth (Professor of Logic and Analytic Philosphy, Groningen University, The Netherlands) and the title of her lecture was *Turning the tables. Counteracting the effects of male anxieties: a study of the sexual origins of early human logic.* This lecture elicited many comments and discussion in the home groups afterwards.

On Tuesday in stead of Dimitrina Petrova's keynote lecture on *The relative incompatibility of the gender, science, technology problem field in Western and Eastern European cultures* the East-West Forum took place. In the week before the conference Dimitrina Petrova's office had been visited by intruders who ruined office equipment and some of her recent work. The aftermath of police and insurence made it impossible for her to come. The Forum was chaired by Dora Dolle-Willemsen (The Netherlands);

participants were: Seçkin Ergin (Turkey), Petya Kabakchieva (Bulgaria), Tatiana Koke (Latvia), Vitalina Koval (Russia), Olga Plávková (Czech and Slovak Federal Republic), Adela Rogojinaru and Mihaela Singer (Romania), Hanna Ziajka (Poland), and Valentina Zlenko (Ukraine). They all shared in short their view on women in science and technology in their country. The audience learned a lot and many were disappointed that time was too short to start a more thorough discussion of the problems.

Wednesday morning all conference participants moved to the Eindhoven University of Technology where they were welcomed by the Rector Magnificus Professor Jack van Lint. After his speech Jan Harding (Equal Opportunities Consultant, and Member of the Interim GASAT Board, Alresford, Hampshire, UK) read her keynote lecture on *A decade of concern: the GASAT experience.* A lively discussion was followed by a short coffee break and after that Elin Kvande (Associate Professor, Institute of Sociology, University of Trondheim, Norway) read her lecture on *The gender politics of organisations. A study of male and female engineers.* Both lectures were also of interest to the university staff of whom about 20 had taken the opportunity to attend this part of the conference.

In the afternoon an excursion was made by bus to the House of the Future. This excursion was introduced by two papers from Marion Menten and Annemarie van de Vusse (Delft University of Technology, The Netherlands). A reception by the Board of the Eindhoven University of Technology concluded the day at the university. Back at the Hotel all participants made their last preparations for the concert dinner. Another GASAT tradition followed and during dinner each country was represented with an act, perfectly introduced and chaired by AnnMarie Israelsson. This time all acts were evaluated by a committee of women from Norway and Sweden. And, remarkably, all points given to the acts of each country mounted allways up to ten!

On Thursday morning a last plenary session was dedicated to a presentation of the evaluation of the conference by representatives of the home groups.

Papers: share and discuss

The subjects of the papersessions were organized according to the contents of the 43 accepted formal papers. There were four main themes:

1. Education and Schooling,
2. Employment,
3. Research Methodology and Evaluation Research
4. Joint European Projects.

Papersessions were held on Monday and Tuesday morning before and after a coffee break in three parallel meetings. In each meeting three or four papers were summarized. Chairpersons then led a discussion with authors on questions which arose from the floor.

Workshops and round tables

On Monday afternoon and on Monday and Tuesday after dinner workshops were organized. These sessions were highly interactive. Summaries of these sessions are included in this volume.

Posters and other displays

During the conference, a number of posters, books, brochures and folders, were on display in one of the rooms. On Tuesday afternoon time was organized to discuss these presentations with the authors.

Home groups

Each participant at the conference was allocated to a Home Group containing a mix of 8-10 people from as wide a range of coutries as possible. As in Denmark and Australia the major purpose of the Home Group was to provide an intimate, more personal setting for interaction, reflection and discussion. Home Group meetings were planned each day, except University Day (Wednesday), after the keynote address of that day. A report of the Home Group activities is included in this volume.

CONCLUSION

One of the main objectives of the conference was to create an opportunity to discuss changes in Europe as a whole. We are very satisfied to conclude that we learned a lot about developments which threaten full participation of girls and women in science and technology, in different countries and cultures, and the different ways in which people cope with these developments. During the conference we learned:

1. GASAT is the abbreviation of Gender And Science And Technology. In English 'science' is equivalent to natural sciences, but this is not a matter of course in Eastern European translation. In particular in Slavic languages all university disciplines belong to 'science'; sometimes the impression existed that social sciences are even more 'science' than natural sciences.
2. The concept of technology did not cause definitional problems: it refers all over Europe to applied natural sciences and is studied in tertiary education (professional Colleges and Universities). However, being an engineer does not give the same social status in all countries. As an engineer one can get well paid and prestigeous jobs in Western Europe: the problem is here that few women profit from this situation on the labourmarket. On the contrary in Russia and Bulgaria, for instance, there are many female engineers but they are doing low prestigeous work, often too dirty to be done by men.
3. In Western Europe the choice process for higher education is different from that in former socialist countries in Europe; academic choices of girls and boys are considered as investments for the future and in the West highly influenced by sex differences in life perspectives at school-age. Eastern European students are used to continue education in disciplines they are good at; differences in life perspectives probably are not considered at the moment academic choices are made, or not in the same way as it happens in Western Europe. Therefore more contributions from Eastern Europe focus on sex differences in employment than on these differences in educational choices.

Marijke van Vonderen

OPENING ADDRESS
&
KEYNOTES

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OPENING ADDRESS

Ilja Mottier
Interim Chair of the GASAT Association

Dear colleagues,

I welcome you all to this third European GASAT conference, which all together is the ninth GASAT where we meet. I especially would like to do so on behalf of the board of the GASAT association.
For some of us, this day is one of meeting old friends, others among you are quite new and have to find their way in the group.
Today, at the point of starting a week of intense discussions and of exchange of experiences, we ask ourselves: where do we stand at this moment, and where are we going to. In which sense this conference can help us to go where we intend to go. Or in which sense this conference will teach us that we have to go into another direction, that our expectations are too high, or just not realistic.
I am not going to dress the history of GASAT. Dr. Jan Harding will deal extensively one of these days with all that has been done under the GASAT umbrella.

Objectives of GASAT

Some of you may be aware of the fact that we have founded a GASAT association. The objectives of this association have been formulated on the basis of what we have done in the past. It is therefore good to bring them to the minds of all present.
The objectives of the GASAT association are:

- To encourage research into all aspects of gender differentiation in science and technology education and employment
- To foster gender equity in science and technology, in education and

in the workplace

- To facilitate the entry of women into employment in the fields of science and technology and their progress within such employment
- To foster socially-responsible and gender-inclusive science and technology
- To provide a forum for dissemination and discussion of research findings and experiences of those working in the field
- To provide a support network for those working towards the objectives outlined above.

These objectives contain all the issues that people may feel important. For some it is the issue of the masculine character of science and technology. For others it is the few number of (young) women in the scientific studies and professions. Others are concerned about ethical questions in the research.

We do not all share the same opinions about everything. We may approach things differently, may have a different perception about whether things have to be defined as a 'problem' or not. But there is one thing that we share and that we want to preserve: that is a critical mind.

The gender perspective

We come to GASAT conferences because we do not take all things for granted, because we want to reflect on common practices, because we want to operate in a spirit of innovation and renewal.

This, we believe, should be the state of mind of every teacher, every researcher, every policy maker, every worker, of every citizen.

We are not advocating criticism for its own sake. But we believe that every professional, every intellectual in the field we are working in, must constantly examine their own practices. This is the duty of a professional, it is the duty of us who have had the privilege of advanced education, which enables us to reflect on what we see around us.

The perspective from which we start our analysis is a gender perspective. This means that in analysing situations we encounter, we ask ourselves what place masculinity and feminityoccupy in that situation. Which - overt or covert- conceptions of masculinity play a role. How does this affect men and women?
We may analyse how the discourse about nature uses female expressions. And how the violence towards nature by means of technology is phrased in the imagery of violence towards the female.
We may study the participation of young women in science and technology education, and see that in many countries this participation lags behind that of young men. What are the reasons and how can we change it? Do we want to change it?
What image does the public have of a 'typical scientist' and his (because it is a man!) character, and how does this affect men?
Or how can we get more women in economically attractive technical jobs, and have them stay there?
What do we know about the history of women in science?

All these are exemples of questions to deal with when studying the gender perspective in science and technology. And they have been discussed during GASAT conferences. Our aim is at least a better understanding of phenomena we see around us.
We can say research ends here. But for most of us, gender studies have emancipatory potential: when we encounter situations we esteem undesirable, we want to change them. To the benefit of women, or to the benefit of men, depending of who is touched by the prejudice.

Women in science and technology: the situation
This is more or less how we have been looking at gender studies during GASAT conferences. But 'we' is not an easy term. Who is 'we' at conferences with a worldwide character. Is every researcher in the whole world looking at problems of gender and science and technology in the same way?

Of course not. And this is at the same time a challenge and a risk. GASAT issues started in the Western world, with people who thought more or less the same. Now that GASAT is spreading, we see different opinions coming into the conference. This is something we have to be aware of, we have to find a way to deal with it, and we have to ask ourselves in which way we want to reorient GASAT objectives, if necessary, and in which way not.

I would like to illustrate this point by looking at the issue that made us start GASAT: the low participation of young women in science and technology. A whole series of researches has been carried out into possible reasons. Within the girls: their interest, their performance, their spatial ability, their manual skills, their career perspectives, their peer group behaviour, everything has been investigated. The same can be said for the within-school processes: the masculine content of the curriculum, the language of the schoolbooks, the interaction in the classroom, the counsellor's behaviour, the teacher's expectations.

The low participation was seen as a widespread phenomenon. Ten years ago, it seemed a universal concern. We see more nuances now.

Let us make some geographical excursions.

Almost all of the above mentioned themes have been researched in Anglo-saxon countries: the USA, Australia, Canada, Great Britain, and we may add countries like the Netherlands, Germany, Scandinavia.

To give an exemple of the low participation of women in science: in the Netherlands in pre-university schools we have in 1990 29% of girls choosing physics, and 62% of boys. In shorter types of schools (mavo) the percentage for girls is 18%.

From countries in Southern Europe, we get different messages. Many colleagues will tell you there is no problem for women in science in, let us say, France or Portugal. And indeed, if we look at the statistics, we see in Portugal up to 67% of girls in natural sciences at secondary level, and 33% of boys. In France: section mathematics and physics: 50% girls, 50% boys;

technician's certificate: 29% girls, 71 % boys. Which seems a good statistic, compared to most other European countries. In higher education the Southern European countries score relatively high too:
engineering enrolment of young women:
Greece 17%, Portugal 24%, France 16%.
In contrast:
Netherlands 9%, UK 8%, Ireland 6%, Germany 7%.
(Statistics compiled by Eurydice in 1990).

The situation in developing countries is unclear. In some, the position of girls lags behind the boys, in others the position of youngsters in education seems less determined by sex than by overall lack of financial means. The picture is more complex than this, because of course we cannot treat the major part of the world in one sentence as 'developing' countries. We have to make a closer analysis of the social and cultural contexts of parts of the world, if we want to come to an understanding of the position of women in science. The position of young women in Asia is not the same as in Muslim education, and even within Muslim states the situation is different. And although we are dealing with these issues at GASAT conferences, we still cannot say we have a clear picture of the position of women in science and technology - studies and occupations - throughout the whole world.

And Eastern Europe?
There seems not to be a problem with women in science and technology in Eastern Europe. There are lots of women studying science and technology and working in scientific and technical jobs. The actual contributions to this conference do not seem to contradict this image.
For a closer look we should have to take country per country, but it is not probable that this would change our entire thinking.

Women in science and technology: the questions

I tried to make a rapid geographical tour with you and to present issues in a rather 'neutral' way.

Now let me come back to what I said in the beginning about the critical potential of gender studies. Gender studies, I said, means that in analysing situations, we ask ourselves what place masculinity and feminity occupy in that situation. Which - overt or covert- conceptions of masculinity play a role. How does this affect men and women?

With this in mind, let us go back to our geographical tour and see where we stand now with our knowledge and understanding.

In the Anglo-saxon countries a lot of gender analysis has been applied. We have analysed the discourse and interaction in the classrooms, the content of the curriculum. We dealt with learning styles. We made single sex classes. We had vocational training for young women and re-entry women.

What were the results: a slight increase of women in science and technology, the critical ratio for women in technology being at the best at 30%. Feeble breaches in the labour market.

A lot of mass media campaigns. Lipservice from employers in case of labour market shortages. And the uneasy feeling among many women: are we still used- again- to fill the gaps in the labour market, and are we sent home when we are not needed any more. Are we using the right instruments, and addressing the right target group at the right moment: must we focus on getting as many women as possible in technology, or must we concentrate on those who have already an interest, and prevent them from dropping out? Are we not starting too late when we address the sixteen year olds? Should we not all be teaching technology to the ten year olds? Must we really adapt our curriculum to the needs of girls? And then we look at Eastern Europe and say to ourselves: this was probably not done in Russia, and yet women studied science. How did they do it?

We try to change things in education, but see that the society around us is not changing at the same pace.

Well, you see, not an optimistic evaluation, and quite a research program.

Now some critical remarks about Southern Europe. The situation there, I confess, is something I still have not grasped completely. Many people will tell you there is no problem for women in science in Southern Europe. And I have given you some statistics who corroborate this allegation. Colleagues from there will tell you that there is no problem for women in the schools, that it comes in the labour market.
Yet I also see projects and materials being developed the same way as it is done in Great Britain or Germany. France has a large campaign to get young women into technology. In Spain booklets are made about women and science, women and computers.
With the GASAT conference we do not succeed in attracting many colleagues form Southern countries, who could clarify these issues for us. Is this only because of the language, or is there really no problem for women in science?

At our GASAT conference in Sweden developing countries were high on our agenda. And we are attracting, especially at the world conference, more and more colleagues from these countries.
This should bring elements in our conferences which are hitherto too little discussed. Questions of race and ethnicity: do they play a role in science education which is specific for science? Do ideas about feminity influence the options for girls? Does single sex education in Muslim countries foster science and technology for girls? Are black girls in technology double-discriminated?
And, more optimistic question: what use can science education make from the native knowledge about nature in less developed countries.
A necessary question too: can women with science education play a role in the society themselves, or is all public life, included educational policy and labour market policy, governed by men?

I finally come to some questions concerning Eastern Europe.

In the Eastern European countries, there are lots of women in science and technology, as there are in the technical professions. What was the determining factor that made those women go? In the West we look at it and try to imagine factors from which we could learn.

The social context: all citizens were supposed to work outside the home, work was not considered as a 'hobby' for women. Children have working mothers.

The school: a female teaching staff, therefore role models in science.

Contacts between schools and the working place, few contacts outside the country: accent on science and technology, less on modern languages.

Subjects girls in the West are traditionally good at.

These are some of the factors that we think can contribute to women's choice of science. They were fulfilled in the Eastern countries. Did they make the difference?

More than ten years of gender studies make one suspicious in many respects, and we in GASAT are. So other questions come up as well: what is the status of science, of technology in society?

Is there a free choice of study, or is there a planned entrance to higher education.

What are the men choosing?

How is the position of women in science and technology developing since the opening towards the West. How is women's employment developing?

Answers to these questions might throw different light on the position of women in science and technology.

But one thing is sure: the women *did* study science and technology. Apparently no lack of spatial ability. No lack of logical reasoning. No lack of selfconfidence, no negative advice from teachers. Are your genes different from ours, or how did you do it?

I think it is worth studying those questions, in order to see if they can provide us with insight.

And to the women from the East I would like to ask: why do you come to a GASAT conference? How do you think you can benefit from it?

When I read your contributions to the conference, there is one remark that comes to my mind: learn to be suspicious when the position of women is at stake. Never take things for granted. If it is said: this measure, this act, is good for women, check whether it is true, keep following the outcomes.

If a new curriculum is proposed, analyse if it contains topics of interest for both women and men. This means: topics for women and men together, topics for men, topics for women. And this all in the same curriculum.

Remember we are in GASAT not talking about gender-neutral science, but about *gender-inclusive* science.

If a new course of study is proposed, does it lead for women to solid job perspectives?

Are men given any education about what it means to be a working person and to have a family?

We hope a mutual exchange will take place: from the West to the East about the inclusion of the gender perspective in your work, from the East to the West the insight about what in your systems worked for women.

Dear colleagues,

You are starting a conference where you want to discuss lots of things. Questions in your own papers you sent us months ago. And now I come up with new questions! I nevertheless thought it better to do it now than at the end of the conference. May be you can think it over.

I have in the past minutes started by remembering the objectives of GASAT. I stressed that GASAT is an association which analyses problems from the point of view of gender, that we remain critical, and that we want to use our insight to change the position of either sex when we see that groups are discriminated on the basis of sex, and, I add, of race and ethnicity.

I then made a brief tour around the world describing the position of women in science and technology. In doing so, I showed that in spite of libraries full of research, there is still a lot, in every place in the world, that we don't know. Putting all our incertitudes together would show us possible research programs. The worldwide position of women has become too complex to be phrased in one uniform analysis. But still, we can use this conference to meet each other and to gain a better understanding of the social contexts we live in and how this shapes our lifes in science and technology.

I wish you a good conference.

PSYCHOLOGICAL AND SOCIAL BARRIERS TO WOMEN'S PARTICIPATION IN MATHEMATICS AND PHYSICAL SCIENCE

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Abstract

Despite recent efforts in the United States to increase the participation of women in advanced educational training and professional fields linked to applied mathematics and technology, women are still underrepresented in these fields of study and work. This is even true among women gifted in mathematics. Why? Many possible causes have been proposed by interested researchers. This paper focuses on a set of social and psychological factors that my colleagues and I have been studying for the last 20 years. It begins with a brief review of the gender differences in educational and occupational choices among the gifted - focusing particularly on math-related fields. It then summarizes a model to account for these differences, reviews the available evidence to support the hypotheses generated by the model, discusses the role that socialization agents may play in perpetuating these gender differences.

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Despite recent efforts in the United States to increase the participation of women in advanced educational training and professional fields linked to applied mathematics and technology, women are still underrepresented in these fields of study and work. This is even true among women gifted in mathematics. Why? Many possible causes have been proposed by interested researchers. Discussing all of these is beyond the scope of a single talk. So today I'll focuses on the set of social and psychological factors that my colleagues and I have been studying for the last 20 years. I'll begin with a brief review of the gender differences in these patterns among the gifted. I will then summarize a model to account for these differences, review the available evidence to support the hypotheses generated by the model, discuss the role of socialization agents may be playing in perpetuating these gender differences. I will focus in particular on recent findings regarding the under representation of gifted women in maths and physical science. The fact that gifted women are underrepresented in these fields is especially worrisome since these women clearly have sufficient intellectual talent to participate as fully as their male peers in these educational and vocational settings.

Gender Differences in Educational and Occupational Patterns

In reviewing the educational and occupational patterns of gifted men and women, I have relied heavily on two sets of data: the longitudinal data compiled on Terman's gifted population and the cross-sectional and longitudinal data being compiled by researchers associated with the Study of Mathematically Precocious Youth originally based at Johns Hopkins University.

Terman's Gifted Population

In 1921, Terman began a longitudinal study of approximately 1,450 gifted boys and girls 7 to 15 years old. The original sample contained 831 males and 613 females. These individuals have been recontacted several times; extensive demographic, intellectual, and social-developmental data were gathered at each contact. Because the researchers have been able to relocate approximately 80 percent of the original sample at each new wave of data collection, this longitudinal study provides the richest and most complete set of data available on the life-span development of gifted males and females. Although bound by its historical period, it provides the best data available for comparing the educational and occupational patterns of gifted males and females.

Gender differences in the educational and educational patterns of Terman's sample first emerged when the sample was in college. These women and men chose very different fields at both the graduate and undergraduate level (Terman & Oden, 1947), in particular, with relation to physical science and engineering: The men were 8-15 times more likely than the women to earn degrees in engineering; similarly the men were 3 times more likely than the women to earn degrees in physical science. In contrast, the women were 3-9 more likely than the men to earn degrees in education and the humanities. There were also substantial differences in the amount of education obtained by the females and males in this study. While the men and women were equally likely to earn their bachelor's degree, the men were more likely than the women to complete graduate degrees.

Differences in occupational patterns are even more extreme (Oden, 1968). The most striking difference lies in the proportion of men and women who reported having an occupation: only 42% of the women were employed during most of their adult years compared to 96% of the men. These women and men also tended to be employed in gender-role stereotypic jobs. The women were especially likely to be underrepresented in high status jobs of all kinds, and in the fields of science and engineering (less than 1% of the women compared to 15% of the men. In contrast, the were over represented in the fields of precollege teaching (27% versus 4% of the males), and social welfare (6% compared to 0%). Clearly these gifted women were greatly underrepresented in the fields of math and physical science despite their exceptional talent.

Johns Hopkins Study of the Gifted

Over the past 20 years, Julian Stanley and his colleagues at Johns Hopkins University have been studying mathematically and verbally precocious children. During this period, several thousand junior high school-aged children drawn from regional and national talent searches have been given aptitude tests and questionnaires tapping attitudes, career plans, interests, and values. Many of these children have been or are currently being retested in order to chart their educational development.

Perhaps the most interesting aspect of the data emerging from these studies is their similarity to the findings of the Terman studies, especially given the social changes that have occurred during the last 50 years. Just as was true in the Terman study, fewer females than males have emerged as gifted in mathematics in each of the Johns Hopkins studies (Benbow & Stanley, 1982, 1983). Furthermore, the boys in the Johns Hopkins samples have consistently scored higher than the females on the SAT-Math test (the test used by the Johns Hopkins team to assess mathematical talent)(Benbow & Stanley, 1982, 1983). Finally, the girls have scored as well as the boys on the SAT-Verbal test (the test used to assess verbal talent). Thus, as was true of the Terman sample, giftedness in math is more common and more extreme among boys. In contrast, verbal precocity appears more equally distributed between the sexes (Fox & Cohn, 1980).

The pattern of gender differences in educational pursuits is also quite similar across the two studies despite the lapse of 50 years. In fact, differences that were not apparent until college in the Terman sample are evident in the Johns Hopkins samples by junior high school. This difference is best characterized in terms of the under representation of girls in "extra" educational settings, especially settings associated with math and science. The Johns Hopkins teams have consistently found that gifted girls were less likely than gifted boys to be enrolled in accelerated and/or special math and science programs (Benbow and Stanley, 1982; Stanley, 1976), to respond positively to an invitation to join a gifted math and science program (George and Denham, 1976; Stanley, 1976), and to enter college early (Stanley, 1976). In addition, in follow-ups of the boys and girls who enrolled in the Johns Hopkins Summer Enrichment courses, the girls were less likely to remain on an accelerated math track (Fox and Cohn, 1980), enrolled in fewer physics courses (Benbow and Stanley, 1982; Benbow and Minor, 1986), were less likely to take AP courses in the sciences and less likely to take advanced placement exams or college board achievement tests in chemistry and physics (Benbow and Minor, 1986), expressed less interest in majoring in science or engineering in college than the boys (Benbow and Stanley, 1984) and reported liking physics and chemistry less in high school (Benbow and Minor, 1986), and finally were significantly less likely to major in the physical sciences and engineering in college, to seek post graduate training in physics, computer science, and engineering, and to aspire to a career in physical science and engineering, particularly a research career in these fields (Benbow, 1988). These difference exist despite the fact that these girls, like the girls in the Terman study, did just as well as the boys in their high school math and science courses.

Conclusions

As is true for the population at large (Eccles, 1984), gifted females are less likely to study and to enter occupation related to applied mathematics, physical science and engineering. One might argue that the under representation of females in the sciences is a natural consequence of the pattern of gender differences on the aptitude measures taken by both Terman and the Johns Hopkins team. This is an unwarranted conclusion for several reasons. First, both of these studies focused on gifted children. Thus, even though the females may have had less math aptitude than their male peers, they certainly had sufficient aptitude to become important contributors to the scientific professions. The critical question was pointed out by Lila Braine in her response to Benbow's 1988 article in Brain and Behavioral Science - to quote "WHY ARE WOMEN VIRTUALLY ABSENT FROM FIELDS FOR WHICH THEY CLEARLY HAVE THE REQUISITE MATH SKILLS?" Second, while aptitude differences were positively related to the subsequent mathematical training of gifted boys in the Johns Hopkins programs, aptitudinal differences were unrelated to the gifted girls' decisions regarding both enrollment in subsequent accelerated math classes (Fox and Cohn, 1980) and intended college major (Benbow and Stanley, 1984). Furthermore, the gender differences in high school physics enrollment and in intended college major were significant even with the differences in math aptitude controlled (Benbow and Stanley, 1982, 1984; Benbow and Minor, 1986; Benbow, 1988).

Given these concerns, it is quite likely that social forces and personal beliefs play a significant role in perpetuating these gender differences in the educational and vocational patterns of gifted individuals. And, although institutional barriers and discriminatory practices undoubtedly account for some of the differences, psychological and social developmental processes are also important (see Eccles, 1984; Eccles and Hoffman, 1984). These processes are the focus of the remainder of this talk. Neither the potential causal impact of aptitudinal differences on male and female achievement patterns nor the possible causes of gender differences in performance on aptitude tests will be discussed.

Psychological Influences on Educational and Vocational Choices

In particular I will focus on a general model of achievement-related choices developed by my colleagues and I over the past several years (Eccles, Adler, Futterman, Goff, Kaczala, Meece, and Midgley, 1983 and Meece et al., 1982). Given the importance attached to gender role by many investigators in this field (e.g. Fox and Cohn, 1980; Nash, 1979), special attention will be paid to the ways in which gender-role socialization may be affecting gifted individuals' educational and occupational decisions.

A Model of Achievement-Related Choices

Over the past 20 years, my colleagues and I have studied the motivational and social factors influencing such long and short range achievement goals and behaviors as career aspirations, vocational and avocational choices, course selections, persistence on difficult tasks, and the allocation of effort across various achievement-related activities. Given the striking differences in the educational and vocational patterns of intellectually able, as well as gifted, males and females, we have been particularly interested the motivational factors underlying males' and females' educational and vocational decisions. Frustrated with the number of seemingly disconnected theories proliferating to explain gender differences in these achievement patterns, we developed a comprehensive theoretical framework to guide our research endeavor. Drawing upon the theoretical and empirical work associated with decision-making, achievement theory, and attribution theory (see Atkinson, 1964, Crandall, 1969, and Weiner, 1974), we have elaborated a model of achievement-related choices. This model, depicted in Figure 1, links educational, vocational, and other achievement-related choices most directly to two sets of beliefs: the individual's expectations for success and the importance or value the individual attaches to the various options perceived by the individual as available. The model also specifies the relation of these beliefs to cultural norms, experiences, aptitudes, and to those personal beliefs and attitudes that are commonly assumed to be associated with achievement-related activities by researchers in this field (Eccles et al., 1983). In particular, the model links achievement-related beliefs, outcomes, and goals to causal attributional patterns, to the input of socializers (primarily parents and teachers), to gender-role beliefs, to self perceptions and self concept, and to one's perceptions of the task itself. Each of these factors are assumed to influence both the expectations one holds for future success at the various achievement-related options and the subjective value one attaches to these various options. These expectations and the value attached to the various options, in turn, are assumed to influence choice among these options.

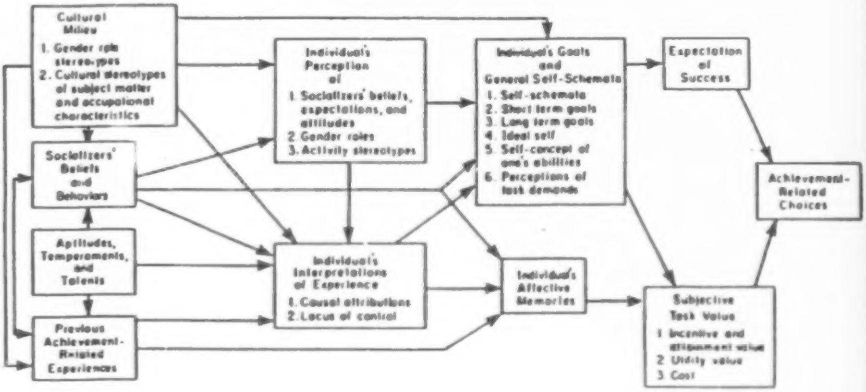
Cultural Milieu
1. Gender role stereotypes
2. Cultural stereotypes of subject matter and occupational characteristics
Socializers' Beliefs and Behaviors
Aptitudes, Temperaments, and Talents
Previous Achievement-Related Experiences
Individual's Perception of
1. Socializers' beliefs, expectations, and attitudes
2. Gender roles
3. Activity stereotypes
Individual's Interpretations of Experience
1. Causal attributions
2. Locus of control
Individual's Goals and General Self-Schemata
1. Self-schemata
2. Short term goals
3. Long term goals
4. Ideal self
5. Self-concept of one's abilities
6. Perceptions of task demands
Individual's Affective Memories
Expectation of Success
Subjective Task Value
1 Incentive and attainment value
2 Utility value
3 Cost
Achievement-Related Choices

Figure 1. General model of achievement and activity choice.

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For example, let us consider course enrollment decisions. The model predicts that people will be most likely to enroll in courses that they think they will do well in and that have high task value for them. Expectations for success depend on the confidence the individual has in his/her intellectual abilities and on the individual's estimations of the difficulty of the course. These beliefs have been shaped over time by the individual's experiences with the subject matter and by the individual's subjective interpretation of those experiences (e.g. does the person think that her/his successes are a consequence of high ability or lots of hard work?). The value of a particular course is also influenced by several factors including the following: Does the person like doing the subject material?; Is the course required?; Is the course seen as instrumental in meeting one of the individual's long or short range goals?; Have the individual's parents or counselors insisted that the course be taken or, conversely, have other people tried to discourage the individual from taking the course?; Is the person afraid of the material to be covered in the course?

Three features of our model are particularly important for understanding gender differences in educational and vocational decisions: The first of these is our focus on achievement-related choices as the outcome of interest. We believe that individuals continually make choices, both consciously and nonconsciously, regarding how they will spend their time and their efforts. Many of the most significant gender differences in vocational aspirations and occupational choices, occur on achievement-related behaviors that involve the element of choice, even if the outcome of that choice is heavily influenced by socialization pressures and cultural norms. Conceptualizing gender differences in achievement patterns in terms of choice takes one beyond the question of "Why aren't women more like men?" to the question "Why do women and men make the choices they do?". Asking this latter question, in turn, legitimizes the choices both women and men make and suggests several new variables as possible mediators of the gender differences we observe in individuals' educational and occupational choices. By legitimizing the choices of both men and women, it allows us to look at the gender differences from a choice perspective rather than a deficit perspective.

Conceptualizing gender differences in achievement-related behaviors in terms of choice highlights a second important component of our perspective; namely, the issue of what becomes a part of an individual's field of possible choices. Although individuals do choose from among several options, they do not actively, or consciously, consider the full range of objectively available options in making their selections. Many options are never considered because the individual is unaware of their existence. Other options are not seriously considered because the individual has inaccurate information regarding either the option itself or the individual's possibility of achieving the option. For example, a girl may have inaccurate information regarding the full range of activities an engineer can do or inaccurate information regarding the financial assistance available for advanced educational training. Still other options may not be seriously considered because they do not fit in well with the individual's gender-role schema. Assimilation of the culturally defined gender-role schema can have such a powerful effect on one's view of the world that activities classified as part of the opposite sex's role are rejected, often nonconsciously, without any serious evaluation or consideration.

Understanding the processes shaping individuals' perceptions of their field of viable options is essential to our understanding of the dynamics leading women and men to make such different occupational and educational decisions. Yet there is very little evidence regarding these processes and their link to important work choices. Socialization theory provides a rich source of hypotheses; few of which have been tested. For example, one effect of role models may be legimatizing novel and/or non-traditional gender-role options. Parents, teachers, and school counselors can also influence students' perceptions of their field of options through the information and experiences they provide the students regarding various options. Finally, peers can affect the options seriously considered by either providing or withholding support for various alternatives. These peer effects can be both quite direct (e.g. laughing at a girl when she says she is considering becoming a nuclear physicist), and very indirect (e.g. anticipation of one's future spouse's support for one's occupational commitments).

The third important feature of our perspective is the explicit assumption that achievement-related decisions, such as the decision to enroll in an accelerated math program or to major in education rather than engineering, are made within the context of a complex social reality that presents each individual with a wide variety of choices; each of which has both long range and immediate consequences. Furthermore, the choice is often between two or more positive options or between two or more options that each have both positive and negative components. For example, the decision to enroll in a physics course is typically made in the context of other important decisions such as whether to take advanced English or a second foreign language, whether to take a course with one's best friend or not, whether it's more important to spend one's senior year working hard or having fun, etc. Too often theorists have focused attention on the reasons why capable women do not select the high status achievement options and have failed to ask why they select the options they do. This approach implicitly assumes that complex choices, such as career and course selection, are made in isolation of one another; for example, it is assumed that the decision to take advanced math is based primarily on variables related to math. We explicitly reject this assumption, arguing instead that it is essential to understand the psychological meaning of the roads taken as well as the roads not taken if we are to understand the dynamics leading to the differences in men's and women's achievement-related choice.

Consider, as an example, two gifted high school students: Mary and Barbara. Both young women enjoy mathematics and have always done very well. Both have been identified as gifted in mathematics and have been offered the opportunity to participate in an accelerated math program at the local college during the next school year. Barbara hopes to major in journalism when she gets to college and has also been offered the opportunity to work part time on the city newspaper doing odd jobs and some copy editing. Mary hopes to major in biology in college and plans a career as a research scientist. Taking the accelerated math course involves driving to and from the college. Since the course is scheduled for the last period of the day, it will take the last two periods of the day as well as 1 hour of after-school time to take the course. What will the young women do? It all likelihood, Mary will enroll in the program because she both likes math and thinks that the effort required to both take the class and master the material is worthwhile and important for her long range career goals. Barbara's decision is more complex. She may want to take the class but may also think that the time required is too costly, especially given her alternative opportunity at the city paper. Whether she takes the college course or not will depend a lot on the advice she gets at home and from her counselors. If they stress the importance of the math course then its subjective worth to her will increase. If its subjective worth increases sufficiently to outweigh its subjective cost, then Barbara will probably take the course despite its cost in time and effort.

In summary, we assume that achievement-related choices, are guided by the following: (a) one's expectations for success on the various options, (b) by the relation of the options both to one's short and long range goals and to one's core self identity and basic psychological needs, (c) by the individual's gender-role schema, and (d) by the potential cost of investing time in one activity rather than another. All of these psychological variables are influenced by one's experiences, by cultural norms, and by the behaviors and goals of one's socializers and peers. Let me now discuss each of these variables in more detail as they relate to the achievement-related decisions of gifted men and women. It should be noted, however, that although there are sound theoretical reasons for suggesting these links, in most cases the essential empirical work remains to be done.

Expectations for Success/Confidence in One's Ability

Expectations for success and confidence in one's abilities to succeed have long been recognized by decision and achievement theorists as important mediators of behavioral choice (e.g., Atkinson, 1964; Bandura, 1977; Lewin, 1938; Parsons, Ruble, Hodges, & Small, 1976; Weiner, 1974). There have been numerous studies demonstrating the link between expectations and a variety of achievement-related behaviors including educational and vocational choices among both average and gifted populations. For example, Hollinger (1983) documented a fairly strong relationship between gifted girls' confidence in their math abilities and their aspirations to enter math-related vocations such as engineering and computer science. Similarly, Terman (1926) found a positive relationship between gifted students' subject matter preferences and their ratings of the ease of the subject for themselves.

But do males and females differ in their expectations for success at various academic subjects and in various occupations? For the population at large, females from about age 10-12 report lower expectations for their performance and less confidence in their ability in mathematics than boys; females also score lower on measures of math efficacy than males (Betz & Hackett, 1981; Brush, 1980; Dweck & Licht, 1980; Nicholls, 1875; Eccles, 1989; Eccles et al., 1984) In addition, these differences in self-perception are one of the mediators of the gender differences in occupational decisions. The answers is less clear with regard to the gifted population. For example, on the one hand, Fox (1982) found that highly-motivated gifted girls have lower self-confidence than equally highly-motivated gifted boys; similarly, Terman (1926) found that gifted girls were more likely to underestimate their intellectual skills and knowledge while gifted boys were more likely to overestimate theirs. On the other hand, Tidwell (1980) found no gender differences on measures of general self-concept; similarly, both Tidwell (1980) and Tomlinson-Keasey and Smith-Winberry (1982) found no gender differences on measures of Locus of Control (a construct often linked to self confidence and personal efficacy beliefs; e.g. Bandura, 1977). There is also little evidence to support the hypothesis that gifted girls are less confident than gifted boys of their math and science ability. For example, Benbow and Stanley (l982) found no substantial gender difference in gifted students' estimates of their math and science competence; similarly, although the gifted students in his study did prefer courses that they thought were easier for them, the boys and girls in Terman's study (1926) did not differ in their perceptions of the ease of mathematics. Finally, Schunk and Lilly (1982) found gender difference in gifted children's expectations for success on a laboratory math task.

Given this mixed set of results, it is not clear that gifted girls are typically less confident of their intellectual abilities than are gifted boys. Although it is true than the differences, when they are found, do support this conclusion, the differences, even when they exist, are quite small. Furthermore, the mediating role of these differences in explaining the gender differences in educational and vocational choices has not been demonstrated. It is possible, however, that researchers have been assessing the wrong expectancies. Typically, the students are asked to report on their confidence about succeeding on an upcoming task or course. They are not asked how confident they are that they could succeed in particular professions or in particular advanced training programs. They are also not asked how much effort they think it will take to succeed in various professions or advanced training programs. It could be that gifted girls are less confident than gifted boys of their prospects for success in these more abstract, distant activities. It is also possible that gifted girls are as confident as gifted boys are in their ability to succeed but assume that it will take a lot more effort to succeed than their male peers assume it will take. As noted earlier, either of these beliefs could mediate a gender difference in the educational and vocational decisions of gifted individuals, especially given the gender stereotyping of high status occupations. Clearly more research is needed before these hypotheses can be evaluated.

Values as Mediators of Achievement-Related Choices

Value is the second major component of our expectancy/value model of achievement-related choices. We predict that decisions regarding course enrollments, college majors, and occupational choice are influenced by the value individuals attach to the various achievement-related options they believe are available to them. Furthermore, subjective value is hypothesized to have at least as much influence as expectations for success on educational and vocational choices. Finally, given the probable impact of gender-role socialization on the variables assumed to be associated with subjective task value, gender differences in the subjective value of various achievement-related options are predicted to be important mediators of gender differences in achievement-related choices in both typical and gifted populations. Our own data support this hypothesis. In a longitudinal study of the math course enrollment decisions of high aptitude, college-bound students, gender differences in students' decisions to enroll in advanced mathematics were mediated primarily by gender differences in the value the students' attached to mathematics (Eccles, Adler, and Meece, 1984). More specifically, the girls were less likely than the boys to enroll in advanced mathematics primarily because they felt that math was less important, less useful, and less enjoyable than did the boys.

Since value means many things to different social scientists and since value has received so little systematic attention until recently, I would like to elaborate on our interpretation of value and its link to achievement-related choices before reviewing the empirical literature. Like others (e.g. Crandall, 1969; Crandall, Katkovsky, and Preston, 1962; Raynor, 1974; and Stein and Bailey, 1973), we assume that task value is a quality of the task that contributes to the increasing or declining probability that an individual will select it. We have defined this quality in terms of four components: (1) the utility value of the task in facilitating one's long range goals or in helping the individual obtain immediate or long range external rewards ; (2) intrinsic interest in the task; (3) attainment value or the value an activity has because engaging in it is consistent with one's self-image; and (4) the cost of engaging in the activity. The last two of these are especially important for any consideration of the impact of gender roles on the value people attach to various activity choices. So let me say a little bit more about each of these.

Attainment value. We conceptualize attainment value in terms of the needs and personal values that an activity fulfills. As they grow up individuals develop an image of who and what they are. This image is made up of many component parts including (a) conceptions of one's personality and capabilities, (b) long range goals and plans, (c) schema regarding the proper roles of men and women, (d) instrumental and terminal values (Rokeach, 1973), (e) motivational sets, (f) ideal images of what one should be like; and (g) social scripts regarding proper behavior in a variety of situations. Those parts of an individual's self-image that are central or critical to self-definition should influence the value the individual attaches to various educational and vocational options; these differential values, in turn, should influence the individual's achievement-related choices (Eccles, Adler, and Meece, 1984; Markus, 1980; Parsons and Goff, 1980). For example, if helping other people is a central part of Individual B's image, then B should place higher value on "helping" occupations than on "non-helping" occupations.

Essentially, I am arguing that personal needs, self images, and values operate in ways that both reduce the probability of engaging in those activities or roles perceived as inconsistent with one's central values and increase the probability of engaging in roles or activities perceived as consistent with one's definition of self. More specifically, we believe that individuals perceive tasks in terms of certain characteristics that can be related to their needs and values. For example, a difficult task requiring great effort for mastery may be perceived as an achievement task; if it also involves pitting one's performance against others, it may be perceived as a competitive task. Other tasks may be perceived in terms of nurturance, power, or ascethetic pleasure. Participating in a particular task will require the demonstration of the characteristics associated with the task. Whether this requirement is seen as an opportunity or a burden will depend on the individual's needs, motives, and personal values, and on the individual's desire to demonstrate these characteristics both to him/herself and to others. To the extent that females and males have different self-images, various activities will come to have different subjective value for females and males. And, to the extext that females and males place differential subjective value on various educational and vocational options, they should also differ in their educational and vocational choices. This hypotheses is discussed in more detail later.

Perceived Cost. The value of a task also depends on a set of beliefs that can best be characterized as the cost of participating in the activity. Cost is influenced by many factors, such as anticipated anxiety, fear of failure, and, of particular importance in the discussion of long term educational and vocational choices, the loss of time and energy for other activities. People have limited time and energy. They can not do everything they would like. They must choose among activities. To the extent that one loses time for Activity B by engaging in Activity A and to the extent that Activity B is high in one's hierarchy of importance, then the subjective cost of engaging in A increases. Alternatively, even if the attainment value of A is high, the value of engaging in A will be reduced to the extent that the attainment value of B is higher and to the extent that engaging in A jeopardizes the probability of successfully engaging in B.

Gender-Roles and Task Value

This analysis has a number of important implications for our understanding of gender differences in the educational and vocational choices of gifted, as well as more typical, individuals. Because socialization shapes individuals' goals and values, women and men should acquire different values and goals through the process of gender-role socialization. Through their potential impact on subjective task value, these gender differences in value structure can affect educational vocational choices in several ways.

For one, gender-role socialization could lead males and females to have different hierarchies of core personal values (such as their terminal and instrumental values, Rokeach, 1973). Consequently, tasks embodying various characteristics should have different subjective values for men and women. For example, both boys and girls stereotype mathematicians and scientists as loners who have little time for their families or friends because they work long hours in a laboratory on abstract problems that typically have limited immediate social implications (Boswell, 1979). If the analysis developed in the previous section is correct such a profession should hold little appeal to someone who rates social values high and thinks it is very important to devote time and energy to one's family. Because gifted females rate social values higher than gifted males (Fox and Denham, 1974), gifted females should be less likely to aspire to a career as a mathematician or scientist than gifted males.

Several studies provide support for the hypothesized link between personal values and achievement-related choices. Dunteman, Wisenbaker, and Taylor (1978) studied the link between personal values and selection of one's college major using a longitudinal, correlational design. They identified two sets of values both that predicted students' subsequent choice of major and differentiated the sexes: the first set (labeled thing-orientation) reflected an interest in manipulating objects and understanding the physical world; the second set (labeled person-orientation) reflected an interest in understanding human social interaction and a concern with helping people. Students who were high on thing-orientation and low on person-orientation were more likely than other students to select a math or a science major. Not surprisingly, females in their study were more likely than males to be person-oriented and to major in something other than math or science; in contrast, the males were more likely than the females both to be thing-oriented and to major in math and science.

Men and women could also differ in the density of their goals and values. There is some evidence suggesting that men are more likely than women to exhibit a single-minded devotion to one particular goal, especially their occupational goal. In contrast, women in both gifted and typical populations seem more likely than men to be involved in, and to value, competence in several activities simultaneously (Baruch, Barnett, and Rivers, 1983; Fox, Pasternak, and Peiser, 1976: Maines, 1983; McGinn, 1976; Terman and Oden, 1947). For example, in his study of doctoral students in mathematics, Maines (1983) asked the students what they worried about. The men were most concerned about their professional status and about their mentors' estimates of their professional potential. In contrast, the women were most concerned about the impact of their graduate training on their families and their other interests; they felt that graduate training was taking too much time and energy away from other activities that they valued just as much as their graduate training. This discrepancy could reflect differing density patterns for the hierarchy of goals and personal values held by these men and women. That is, the women appeared to place high attainment value on several goals and activities; in contrast, the men appeared more likely to focus on one main goal: their professional development. If this is true then the psychological cost of engaging in their primary goal in terms of time and energy lost for other important goals would certainly be less for these men than for their female colleagues.

Gender role socialization could lead males and females to place different value on various long range goals and adult activities. The essence of gender roles (and of social roles in general) is that they define the activities that are central to the role. In other words, they define what one should do with one's life in order to be successful in that role. If success in one's gender role is a central component of one's identity, then activities that fulfill this role should have high value and activities which hamper efforts at successfully fulfilling one's gender role should have lower subjective value. Gender roles mandate different primary activities for men and women. Women in the United States are supposed to support their husbands' careers and raise their children; men are supposed to compete successfully in the occupational world in order to confirm their masculinity and to support their families. To the extent that a gifted woman has internalized this cultural definition of the female role, she should rank order the importance of various adult activities differently than her gifted male peers. In particular, she should rate the parenting and the spouse-support roles as more important than a professional career role and she should be more likely than her gifted male peers to resolve life's decisions in favor of these family roles. In contrast, gifted men, like men in general, should rate family and career roles as equally important. In fact, since they can fulfill their family role by having a successful career, gifted men, like men in general, should expect these two sets of roles to be compatible. Consequently, aspiring after a high status, time consuming career should not pose less of a conflict for gifted men and such careers should have high subjective value not only because of the rewards inherent in these occupations but also because they fulfill the male gender role mandate.

The analysis developed in this section suggests the differential involvement of women and men in math and science-related occupations may result, in part, from differences in their interest patterns and their personal values (for example, being thing-oriented versus being person-oriented). Furthermore, this analysis suggests that the differential involvement of women and men in high status, time-consuming occupations requiring long periods of pre-professional training may result, in part, from differences in men's and women's psychological investments in their family roles versus their professional roles. These gender differences in psychological investment in family versus professional roles are assumed to result from a complex set of both psychological and sociological forces including the internalization of gender roles, the individual's assessment of what jobs and roles are realistically available, and both overt and subtle forms of discrimination operating in educational and occupational institutions. Consequently, women may choose to limit their investment in the professional role because they want to maximize their investment in their family roles or because they think that their opportunities in the professional role are restricted by discriminatory forces beyond their control, or both. Since in the United States careers in math and physical science are assumed to be very time consuming and inflexible, women with traditional gender-role identities may be reluctant to enter these fields because they believe the time demands are incompatible with the demands associated with raising a family.

An adequate test of these hypotheses requires not only the demonstration of a gender difference in interest patterns and value hierarchies; it also requires a demonstration of the proposed causal link between these beliefs and the educational and vocational choices gifted men and women make. By and large, these causal links have not been assessed in either gifted or more typical populations. Thus, as was true for expectations of success, the essential research has yet to be done. However, even though the causal relations implicit in this analysis have not been adequately studied, several large scale studies of the gifted have assessed gender differences in personal values and interests. In general the data are consistent with the analysis in this section. The details of these studies are outlined below.

Gender Differences in the Values and Interests of the Gifted

Both the Terman study and the SMYF studies have assessed interests, values, and goals on a large number of gifted individuals. These studies suggest that gifted boys and girls have different interests, values, and goals from an early age. Although gifted boys and girls appeared more similar in their values and interests than comparison groups of boys and girls drawn from the general population, the gifted girls in both studies had more stereotypically feminine interest patterns than the gifted boys. When asked their favorite school subjects the girls rated English, foreign languages, composition, music, and drama higher than the boys; in contrast the boys rated the physical sciences, physical training, U.S. history, and sometimes mathematics higher than the girls (Benbow and Stanley, 1984; George and Denham, 1976; Terman, 1926, 1930). The gender differences in interest in mathematics were typically quite weak if present at all. In contrast, the gender differences in interest in physics and applied mathematical fields like engineering are quite consistent and fairly large (Benbow and Minor, 1986, Benbow, 1988).

Similarly, when asked their occupational interests and/or anticipated college major, girls rated domestic, secretarial, artistic, biological science, and both medical and social service occupations and training higher than the boys while the boys expressed more interest than the girls in both higher-status and business-related occupations in general, and in the physical sciences, engineering, and the military in particular (Benbow and Stanley, 1984; Fox, Pasternak, and Peiser, 1976; Terman, 1926, 1930). Finally, when asked their leisure time activities and hobbies, similar differences in interest patterns emerged. At all ages, the females both liked and reported spending more time than the boys reading, writing, and participating in a variety of activities related to arts and crafts, domestic skills, and drama; in contrast, the males spend more time engaged in sports, working with machines and tools, and involved with scientific, math-related, and/or electronic hobbies (Fox, 1976; McGinn, 1976; Terman, 1926, 1930; Terman and Oden, 1947).

Gender-stereotypic patterns of differences also emerged on tests of personal values, occupational values, and personality traits. The Allport-Vernon-Lindsey Scale of Values was given to many of the children participating in the studies at Johns Hopkins. The gifted girls typically scored higher than the gifted boys on the scales tapping social and aesthetic values; in contrast, the boys typically scored higher than the girls on the scales tapping theoretical, economic, and political values (Fox, 1976; George and Denhan, 1976; McGinn, 1976). Similarly, on the Strong-Campbell Vocational Interest test, the girls scored higher than the boys on social and aesthetic interests. Both of the boys and girls, however, scored equally high (and quite high) on investigative interests (Fox, Pasternak, and Peiser, 1976; George and Denham, 1976; McGinn, 1976).

It is also of interest to note that the boys evidenced a more unidimensional set of interest than the girls on the Strong-Campbell Vocational Interest test; that is, the boys scored high on investigative interests and low on most other interests. In contrast, the girls scored higher than average on several interest clusters (McGinn, 1976). A similar discrepancy emerged when gifted boys and girls were asked to rate several occupations on a Semantic Differential Scale. The boys gave positive ratings only to traditional male scientific and mathematical professions; the female professions and homemaker role were rated negatively. In contrast, the girls gave both male and female typed professions a positive rating. In addition, they gave the homemaker role as positive a rating as their most preferred professional occupations; in contrast, the gifted boys responded rather negatively to the homemaker role.

A similar pattern emerged on the most recent data from the Terman sample (Sears, 1979). The gifted men and women were asked to rate how importance each of six goals were to them in making their life plans during early adulthood. Men rated only area (occupation) as having had higher importance than did the women; in contrast, the women rated four areas as having had higher importance than did the men (family, friends, richness of one's cultural life, and joy in living). These data suggest that the gifted women had desired a more varied or multi-faceted type of life than the men had desired at precisely the time in one's life when people make the major decisions about their life plans. One other pattern characterized the responses of these gifted men and women: Consistent with our hypothesis, the men rated family and occupation as of equal importance while the women rated family as more important than occupation.

Summary. There are clear differences in the interests, values, and preferences between gifted males and females. Furthermore, these differences reflect gender-stereotyped patterns. These results are consistent with the analysis linking values to gender differences in educational and vocational choices. Additional support for this hypothesis comes from a recent report by Benbow and Stanley (1982). Gifted girls in their study were less likely than gifted boys to take advanced mathematics in part because they liked language-related courses more than they liked mathematics courses. In addition, Benbow and Stanley (1984) found weak but consistent positive relations in their gifted samples between liking of biology, chemistry, and physics and subsequent plans to major in biology, chemistry, and physics respectively. In addition, students' interest did predict course taking in high school and college (Benbow and Minor, 1986).

Parents, Teachers, and Counselors

Gender differences in educational and vocational choices could also result from differential socialization experiences. Several studies have documented the importance of social support from parents, teachers and counselors in lives of women who make non-traditional educational and occupational choices (Barnett and Baruch, 1978; Casserly, 1980). Perhaps gifted girls make rather traditional educational and occupation choices because they are not adequately encouraged to consider alternative choices. How might parents, teachers, and counselors affect gifted children's vocational and educational choices?

1. Through their power as role models. Male and females adults do different things and these differences in behavior provide a model of appropriate occupations for males and females.

2. Through their power as interpreters of experience. Social agents can influence children's self concepts, personal values, and preferences through the interpretations of experience that they provide.

3. Through their power as counselors. Social agents can influence children's view of the educational and vocational world through explicit and implicit messages they provide as they "counsel" children. Social agents, especially parents and school personnel, give children information about the occupational world and the need to prepare themselves for that world. Often these messages are gender-role biased. To the extent that this is true, boys and girls will internalize different views of the occupational world, different ideas about their potential involvement in that world, and different ideas regarding the need to be able to support oneself.

4. Through their power as reinforcers. Social agents can influence choices by the pattern of reinforcements they provide for engaging in various behaviors. Peer interaction is an excellent example of how the power of reinforcement could limit women's participation in math, engineering and physical science. Students often discuss the educational and occupational options they are considering with their friends; these discussions inform the students both of the opinions of their peers and of the likely reactions their peers will have to various options. As is true for other social agents, these opinions and reactions are often gender-role biased (see, for example, Frieze and Hanusa, 1984; Kavrell and Petersen, 1984). Since peer acceptance is so important during the adolescent years (Kavrell and Petersen, 1984), the gender-role bias in adolescents' reactions to each other's plans may limit the educational and vocational options considered seriously by gifted females at a time when very important achievement-related decisions are being made. Fear of peer disapproval could also lead gifted girls to either drop out of or refuse to participate in special programs for the gifted.

5. Through their power as shapers of experience. Social agents can influence the educational and vocational decisions of gifted individuals more directly by actively structuring the options that are offered to gifted boys and girls. For example, entry into accelerated or special programs depends on being identified as gifted by school personnel. To the extent that the process of identification is gender-biased, gifted girls and boys may differ in the opportunities they are offered to develop their skills; findings relevant to this prediction are discussed below. Parents can also either limit or broaden their children's educational and vocational options by the economic, as well as psychological, support they provide for various options. In the society at large, families with limited resources are more willing to invest these resources in their sons than in their daughters. If a similar preference characterizes families with gifted children, then gifted males should have more opportunities for special and advanced training than gifted females because their families are more willing to provide such opportunities. Such differences, if they exist, not only limit girls' options directly; they can also limit the development of gifted girls' preferences because they restrict the range of experiences gifted girls are exposed to.

Now lets look at the research related to these types of influence. I'll begin with noting that very little relevant information is available and what is available is quite limited in its scope and reliability. For example, some of the work claiming to show that gender differences among the gifted do not result from differences in boys and girls social experiences is based on a few self-report questionnaire items asking things like "Do you encourage your child to do well in math?" This type of question does not provide an adequate assessment of social experience.

Parents

In both the Terman and the Johns Hopkins studies, the parents of gifted boys and girls believed in their children's general intellectual talents. The child's gender, however, had more effect on the parents' estimates of their child's specific skills. For example, parents in Terman's study rated sons higher than daughters on math and mechanical ingenuity; they also rated daughters higher than sons on drama, music and general dexterity. Since this patterns of gender differences also characterized the children's performance on standardized skill tests, we can not determine the direction of causality for these data; the parents' estimates may have been a reflection of the differences they were observing in their children or the parents may have helped to create the behavioral differences through differential socialization practices (Terman, 1926). In our own study of gifted elementary school children (see Eccles & Harold, 1992), parents of gifted girls had most confidence in their child's ability in reading and instrumental music; in contrast, parents of gifted sons had most confidence in their child's math and sport ability. In addition, these parents provided gifted girls with more opportunity to develop their reading and instrumental skills while they provided their gifted sons with more opportunity to develop their interest and skill in sports. Interestingly, there were no gender differences on the aptitude measures we gave these children at the start of the study. Together these results suggest the parents of these gifted children were creating rather than reflecting gender differences in their children's aptitude.

Studies with more typical populations also suggest that the parents are creating gender differences in skill level, interest patterns, and self-perceptions through differential socialization (Eccles, 1992; Huston, 1983; Parsons, Adler, & Kaczala, 1982). For example, in a longitudinal study of gender role socialization duirng the elementary school years, we have shown that parents have gender-role biased perceptions of their children's competencies: they believe boys are better than girls in sports and math while girls are better than boys in language arts and instrumental music. The parents in this study also believe that boys are more interested than girls in sports, math, and science, while girls are more interested than boys in reading and instrumental music. These perceptions exist despite very little actual gender difference in the children's aptitudes and interests (Eccles, 1992). Proponents of a self-fulling prophecy view of the socialization of gender differences would argue that these differences in parents' perceptions set in motion a set of events that ultimately create the very differences that the parents originally believed to exist. But few studies have looked at the link between the experiences provided by parents and parents' beliefs. In our recent work, we have investigated how this process of differential provision of experiences is linked to general and specific beliefs, particularly with regard to gender-role socialization. The evidence suggests that parents' general gender-role beliefs influence their perceptions of individual children's competencies and interests: for example, parents who endorse the cultural stereotype that boys are naturally better at math (or sports) than girls, have lower estimates of their daughters' math (and athletic) ability than one would predict given the girls' actual level of competnece as measures by our aptitude indicators and by teacher ratings. In turn, these perceptions affect the kinds of experiences parents provide for their children: these parents provide boys with more opportunities to do math-related (and athletic) activities than they provide for girls.

This sequence is illustrated in Figure 2. This figure illustrates the theoretical model my colleagues and I have been using to study the socialization of gender differences in interests and competencies. Essentially, we are hypothesizing that parents' gender-role stereotypes, in interaction with their child's sex, affect the following mediators: (1) parents' causal attributions for the children's performance, (2) parents' emotional reaction to their children's performance in various activities, (3) the importance parents attach to their child acquiring various skills, (4) the advice parents provide their child regarding involvement in various skills, and (5) the activities and toys parents provide for their children. In turn, we predict that these subtle and explicit mediators influence the development of the following child outcomes across the various gender-role stereotyped activity domains: (1) children's confidence in their ability, (2) children's interest in mastering various skills, (3) children's affective reaction to participating in various activities; and, as a consequence of these self- and task-perceptions, (4) the amount of time, and type of effort, the children end up devoting to mastering, and demonstrating, various skills (see Eccles, 1992; Eccles, Jacobs, & Harold, 1991). Our initial results confirm these predictions

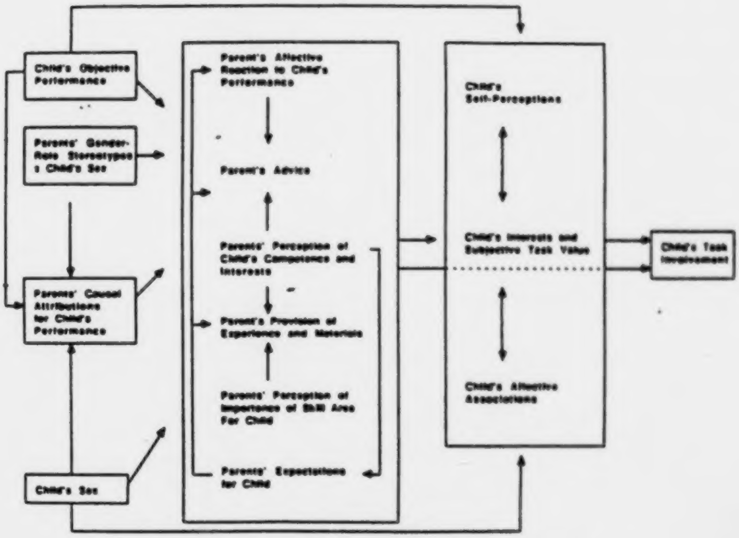
Child's Objective Performance
Parents' Gender-Role Stereotypes x Child's Sex
Parents' Causal Attributions for Child's Performance
Child's Sex
Parent's Affective Reaction to Child's Performance
Parent's Advice
Parents' Perception of Child's Competence and Interests
Parent's Provision of Experience and Materials
Parents' Perception of Importance of Skill Area For Child
Parents' Expectations for Child
Child's Self-Perceptions
Child's Interests and Subjective Task Value
Child's Affective Associations
Child's Task Involvement

Fig. 2. Theoretical model of self-fulfilling prophecy effects in the family.

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Gender-role bias in parental beliefs is evident on other measures as well. Parents in the Johns Hopkins' studies were asked their occupational aspirations for their children. These parents had rather limited occupational aspirations for their daughters; the majority of the parents of girls (between 89 and 94 percent in one study) expected their daughters to follow the traditional female-occupational pattern of working for a while and then taking time out to raise their children (Brody and Fox, 1980; Fox, 1982). The parents were also more likely to expect their sons to enter math-related or scientific fields (Brody and Fox, 1980) and to provide their sons with math-and science-related toys, kits, and books (Astin, 1974). Finally, parents of daughters reported noting giftedness in their child at a later age than parents of sons (Fox, 1982) and were often quite surprised when informed that their daughter might be gifted (Fox, personal communication). Thus, although parents have a generally positive attitude toward their daughters' intellectual talents, they do not appear to be encouraging their daughters to develop these talents in occupational pursuits to the same extent that parents of boys do. And in many cases, they appear to underestimate their daughters' talents.

Finally, there is clear evidence that mothers and fathers model different involvement in various academic subjects. Benbow and her colleagues have found that fathers are more likely to help their children in math and science than are mothers. This difference in parental behavior could influence the boys' and girls' interest in the science.

Teachers and Counselors

The data on teachers are quite mixed. On the one hand, Terman (1926, 1930) found teachers to be quite positive toward both gifted boys and girls. The teachers rated gifted girls more positively than gifted boys in terms of their performance and competence on most subjects and on deportment. In addition, boys were more often reported as being weak in at least one subject than girls. On the other hand, both Terman (1926) and Fox (1982) found that teachers were less likely to identify girls as gifted and to recommend them for accelerated educational progress. Furthermore, to the extent that teachers held negative stereotypes of gifted children, their stereotypes of gifted girls were more negative than their stereotypes of gifted boys (Solano, 1977). Finally to the extent that teachers treat boys and girls differently in the classroom, these differences are most marked among the brightest students in the class (Brophy and Good, 1974; Parsons, Kaczala, and Meece, 1982).

Both Fox (1976) and Luchins and Luchins (1980) present an even more negative picture of teachers. Fox (1976) found evidence of active resistance on the part of some teachers to continued accelerated math training for the girls who had participated in the Johns Hopkins Summer Accelerated Math Program. Furthermore, the presence or absence of teacher and counselor support for continued participation in accelerated math training was the major factor distinguishing between the girls who continued and the girls who chose to drop back into a more traditional math program. Similarly, in their study of female mathematicians, Luchins and Luchins (1980) found that 80 percent of the females, as compared to only 9 percent of the males, had encountered active discouragement from continuing their math training; this discrepancy was especially pronounced during the college years. Similar results characterize studies of more typical populations. When bias exists math and physical science teachers provide boys with a more positive learning experience than girls (see Eccles, 1989).

Evidence regarding the role of counselors is sparser but equally troublesome. In general, counselors have not been found to be especially encouraging of non-traditional educational and occupational choices for either boys or girls (see Eccles and Hoffman, 1984). A similar pattern characterizes the few available studies on the role of the counselor for gifted students. For example, counselors have been found to actively discourage gifted girls from continuing their accelerated math training program (Fox, 1976). Likewise, more than a quarter of the gifted adults interviewed by Post-Kammer and Perrone (1983) reported that their high school counseling had been poor or inadequate. Similarly, Benbow and Stanley (1982) found that less than 12% of gifted students they identified in their talent search were participating in any special programs; thus, the majority of gifted children are not receiving any special opportunities designed to facilitate the development of their extraordinary intellectual talent. And girls are less likely than boys to be among the few who do receive these special opportunities: For example, only 6% of the girls compared to 11% of the boys in the Benbow and Stanley (1982) sample were in special programs.

These results are especially disturbing given the growing body of evidence that teachers and counselors can be an important source of encouragement for gifted girls. Several studies have demonstrated the positive effect of supportive teachers and well-designed classroom intervention programs on gifted and talented girls educational and vocational plans (e.g. Brody and Fox, 1980; Callahan, 1979; Casserly, 1980, Fox, 1976; Fox, Benbow, and Perkins, 1983; Gordon and Addison, 1985; Tomlinson-Keasey and Smith-Winberry, 1982, 1983; Tobin and Fox, 1980). For example, Tomlinson-Keasey and Smith-Winberry (1983) found that a strong positive association between gifted girls' interest in high level careers and their involvement in high intensity special programs for the gifted.

Pat Casserly (1980)'s work provides another clear example of this. She identified the 20 school districts in the United States that had the best record of enrollment by talented females in their advanced placement courses (AP courses)in math and science; she interviewed students, teachers, and counselors at these schools regarding the factors that they believed accounted for the high participation rates of the female students in these courses. Several themes emerged rather consistently across the districts: early placement in a curricular track that leads automatically to the AP (advanced placement) courses; high proportions of females in the classes from the beginning of the tracking sequence; active efforts to allow female friends to stay together in these courses; active support by the teachers of the females' interests, confidence, and, perhaps most importantly, participation in class activities; active recruitment of younger females into the courses by the AP teachers and by female students already enrolled in the AP courses; active career counseling by AP teachers within their classes; and creative, non-competitive instruction in the AP classes.

Casserly's study clearly suggests that supportive teachers can play an important role in encouraging gifted and talented females to develop their math and science skills and to consider seriously careers in math and science. Casserly's study also indicates that early acceleration may be important. Several studies suggest that adolescent gifted girls are less attracted to special programs, particularly in math and science, than adolescent gifted boys (Fox, 1976; Fox, Benbow, and Perkins, 1983; Tobin and Fox, 1980). In contrast, accelerated programs begun in elementary school have as many, if not more, female participants as male participants. Furthermore, both girls and boys enrolled in such programs retain their accelerated status throughout high school and graduate at an earlier age than their non-accelerated peers without any apparent deleterious effects on their intellectual and social development (c.f. Callahan, 1979).

Finally, Casserly's study points to the importance of instructional strategies themselves. The AP teachers in her study were especially likely to include career counseling in their courses, to use non-competitive teaching strategies, to include applied concerns drawn from fields such as engineering, design, medicine, and architecture, to stress the creative components of math and science rather than facts and endless word problem sets, and to be actively committed to nonsexist education. Observational studies of science teachers suggest that a similar set of characteristics differentiates teachers who produce high levels of interest in science among their female students from teachers who do not (Kahle, 1983).

Further support of the importance of these characteristics is provided by Fox (1976). Concerned with the low participation rates of gifted girls in the special program being offered at the Johns Hopkins University for gifted children, these researchers designed a special math class to attract females. This class incorporated many of the "girl friendly" principles uncovered by Casserly and Kahle: It was taught using cooperative learning strategies and included career guidance. In addition, it was taught by females and all the students were females. The class was successful in increasing the participation rates of those gifted female students who successfully completed the program. Unfortunately, longitudinal follow-ups of these students indicate that the long range impact of this experience was minimal, suggesting that one shot interventions are not very effective in producing lasting change and that "girl friendly" practices need to be a continuing part of gifted girls educational experiences (Brody and Fox, 1980).

In summary, these studies suggest that certain instructional styles may be turning girls off to math and physical science - strategies such as competitive learning strategies, heavy focus on the mechanical applications of math and physical science rather than more people-oriented applicatons (such as designing more liveable communities or preventing pollution). To the extent that girls and boys come to school with different value systems (see earlier discussion), courses should have different appeal to girls and boys if the courses incorporate particular value systems into the material used for instruction (e.g., if the teachers use competitive rather cooperative learning strategies or if the teacher relies heavily on thing-oriented examples rather than people-oriented examples, or if the teacher does not make sure that the students are exposed to female as well as male role models and that female students get to participate just as fully as male students in class discussions and class activities). Furthermore, these studies indicate that math and physical science do not have to be taught in these ways; more girl friendly instructional approaches can be used. And when they are, girls are more likely to continue taking courses in these fields and to consider working in these fields when they become adults.

Conclusions

As is true in the population-at-large, gifted males and females differ in their educational and occupational patterns in a rather gender stereotyped fashion. This article explores the reasons why this might be true and outlines a research agenda to study these hypotheses. Gender-role beliefs and schema seem especially important influences in that these schema can affect both expectations for success in a wide range of activities and the subjective value individuals attach to participation in various educational, occupational, and family-related pursuits. The beliefs and behaviors of parents, teachers, counselors, and peers are also critical. These socializers appear to lack confidence in girls' ability or motivation to succeed at math, engineering and physical science and they do little to foster girls' interest in these fields Given the omnipresence of gender-role prescriptions regarding appropriate occupational choices for women, there is little basis for girls to develop non-traditional goals if their parents, teachers, and counselors do not encourage them to consider these options. And there is even less basis if these socializers actively discourage such consideration.

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TURNING THE TABLES

Counteracting the academic effects of male anxieties through information about sexual origins of early human logic[*]

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1. Existential anxieties [1]

At conferences on women's education girls and women are usually taken to be the natural source of all the main conference topics. In connection with women's education one assumes that about boys and men and their motives and career choices there is nothing of much relevance to be said. To talk about men would then seem a waste of time. Women and girls are taken to constitute the whole problem field, and so one treats them (us) as the main objects of research. *Women* are seen to have frustrations, anxieties, and surroundings that stimulate or stifle their cognitive development. In our time, one proudly says, we have finally become alive to the inner emotional world of girls and women, to their expectations, aspirations and anxieties, as factors in women's choice and decision processes.

These new academic pursuits are not wrong, but are so far only half measures. But halfway measures can be improved upon, they can, and should, be supplemented - provided we still want to change the world.

In this talk I shall mostly talk about men.

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2. Men's anxieties, and Lushin's Defense

The existential anxieties of some men have clearly affected their own intellectual work in fundamental manners. In fact, this holds of very many philosophers, mathematicians and scientists of the male sex. This I believe quite a few people would be ready to admit. However, the precise manners in which their anxieties have contributed to their theory construction cannot be analysed in a wholesale manner, as some people seem to hope. The complexity of science, of its surface history and of its mental history demand that cognitive problems relating to men's existential anxieties are studied one by one. In a few minutes I shall offer some examples.

The main point here today is that the intellectual effects of the existential anxieties of many males have been damaging to many, and still are. They have particularly, though not exclusively, been damaging to females. Their intellectually damaging effects on women can be studied as resulting from women's **induced intellectual anxieties**. And these induced intellectual anxieties should certainly not be registered as "(natural) female character traits".

But if one wants to get women's induced intellectual anxieties into focus, then it seems reasonable first to take up the original male anxieties as - relatively new - objects of research.

I should like to offer two components, A and B, of an explanation for the existence of such induced anxieties.

Component A has two sub-components, and so has B. The four, A1, A2, B1 and B2,, are often mixed up. Components A1 and A2 concern decision making, especially men's decision making. Components B1 and B2 are primarily related to the *situation* with which women are confronted.

Both A and B concern the need for self respect. I take for granted here that a clear image of own "gender identity" has always been an indispensable requirement for easy self respect, possibly a necessary condition, for most people. Now how can boys and young men attain their feeling of human value and their social and cultural "identity"?[2]

Component A1 is the following hypothesis concerning this existential problem:[3]

Boys very often solve it by distancing themselves from their immediate surroundings, sometimes - as do many mathematicians, theologians, chess players and clerics - from all of the practical world, from a rather early age onwards, because for them the possibility of acquiring a (safe, positive) identity experience through inspection of their own physical nature is perceived as being blocked. Boys are not given the anatomical possibility of identification with the person who usually takes care of them and loves them and whom they themselves first love and trust. If you are a boy, then you will soon perceive that you are not like your mother, who is a woman, nor will not ever be. You will therefore have to become a different type of person than she and the likes of her. In order to become different, and in order to show yourself and other people that you are different, you will *have to take distance*, at least in some respect, and you will *have* to get your act together and get yourself organized **at a distance**. Let us call this:

A1. Self respect through Identity acquisition at a distance

It is nice to play with an expression taken from classical physics, and to speak of:

A1*. Self respect through (intended) action-at-a-distance.

No field theory here![4]

This existential need for preoccupation at a distance often leads men to complete obsession with things that can satisfy this condition - all kinds of more or less crazy things, from chess to "pure" mathematics or to the construction of machinery that **cannot be used around the house**.[5]

It is not really necessary to assume a genetic basis here. Logically it suffices to understand to the full that very many men have such existential anxieties, and to understand the needs that issue from those anxieties; and the manoeuvres, often of a cognitive nature, chosen to solve the problems issuing from those needs

The said solution to this existential men's problem can be associated with an assumption of higher cosmic or social status, but it need not be associated with this assumption. For this reason it seems to me wrong to identify this existential technique of identity acquisition, A1, with the technique of identity acquisition **by elevation of self** "above" other people, which I shall call:

A2. Self respect through self elevation.

I believe that A1 and A2 are often confounded. It is with the first existential technique we should be concerned here, that of **gendered identity acquisition at a distance**, the acquisition of a positive image of self through detaching oneself and one's activities from the concrete and familiar world. This existential technique serves a need that may occasionally arise in a young woman but which understandably arises more easily and strongly in boys and which in boys seems to be rather common.[6]

The presence of this subjective need in, as it seems, very many boys and men, leads many of them to develop various strategies in the struggle for life that women do not, or less often, employ, and which many women do not know about.

Thus our hypothesis can explain, among other things, the academic successes of the ideals of *anonymity* and *neutrality* in scientific reportage, an ideal "objective" style of writing that is still well known in our time. This style demands, among other things, that no reference be made to individual persons and no mention be made of named persons' feelings and likings and so on in academic reportage and debate - which I personally think is a very good norm indeed.

However, this style also demands that no reference be made to the various **roles and functions of the participants in the laboratory** (in the experimental setting leading to later theory formation), nor to the **communicative roles and functions of theory consumers** (e.g., as participants in scientific debate[7]). Worse even, this ideal demands that also the **cultural roles of the theoretician** - scientific, political, social, educational - be left unmentioned.

I should like to give this masculine strategy, our theory component A1, a certain literary name: **Lushin's Defense**. In memory of the tragical hero in Nabokov's in the novel with this title, his touching and rather lovable professional eternal chess player. Women may adopt this strategy but it seems to be far more common among males, which is what I mean by calling it "masculine".[8]

This strategy alone already is enough to deflect and discourage women's educational and professional aspirations, an observation which ? shall not further discuss here.

Now I come to a factor or explanation component B, that concerns the resulting *cultural* situation for women, but that is less well documented and recognized than component A. There seems to me to be a field-related nearsightedness in the methodology of the social sciences, leading to deplorable blanks in the arsenal of explanatory patterns. Questions are formulated concerning the influence from teachers, parents, friends, and other social factors. There are also some attempts, I believe, to assess women's fear of social isolation by certain career choices. So the immediate or future social surroundings tend to get some scientific attention.

But can we expect ever to get where we want in this manner? When contemplating career possibilities there is also, although no one talks about it, a girl's anxiety and **estimate** - wholly conscious, half-conscious or totally unconscious - **of future exclusion from our culture as a whole**. Is not this anxiety, and her estimate of the degree of cultural exclusion she will have to face, just as important factors in a girl's or young woman's decision making as her anxieties concerning a certain measure of *social* isolation?

How to measure this female fear of cultural exclusion? I would not know, but it does seem to be a factor of importance. Taken as a whole, our culture is (and other contemporary cultures are no better) completely discouraging for girls who get it into their heads to contemplate a career in, say, the technical sciences. If they choose such a career, they choose for a life in which they are constantly reminded of not belonging, or of belonging only in a non-normal sense. They are reminded by their social surroundings - by family, friends or teachers, certainly, but also by their cultural inheritance: by literature, by show business, and the arts, and by behavioral etiquette, religion, fashion, and philosophy. These continual reminders are registered, though not always consciously, and in any case their total impact is almost never articulated. But a girl almost always somehow knows, from her early childhood, that an unusual education will make of her a person without a culture - i.e., **without a supporting culture**, or, a person "without cultural identity". The culture she was born into is then **no longer hers**.

An old American Indian said to Ruth Benedict, the cultural anthropologist: "Every man must drink his life out of a cup; and mine is broken." Read "every girl", "every woman", and you may get what I am trying to say.

This means that we are concerned with the fear that, in the role in which the science or career choice in question puts you, you will never (again) feel a natural part of, and at home in, our culture as a whole.

To a culture we shall then have to count all non-natural sources of future impressions, from Goethe, with his "eternal Feminine", to contemporary fashion and hard porn. Let us call this:

B1. Fear of cultural exclusion.

Obviously, this is *not* the same as:

B2. Fear of social isolation.

Let me sum up. What I call A1 and B1, that is to say contemporary boys' and men's need for identity acquisition at a distance - from home, but **inside our culture** - together with the anxieties their strategies induce in women, as well as women's induced **fear of cultural isolation and exclusion** due to our male-based historical culture as a whole, these are two immensely powerful factors in bringing about contemporary men's and women's actual choices, and in determining their successes and failures.

Clearly, counter-strategies are mandatory.

3. Counteracting cultural exclusion

In the following the word "tuition" is to stand for tuition in the exact, natural and technical sciences. The strategies I shall discuss here concern tuition - class-room tuition as well as textbooks - in these sciences, in particular, but not exclusively, in relation to female students. What I recommend is:

that certain aspects of the early human choice of categories for scientific description and problem solving be integrated into the tuition in the exact and the natural sciences, together with the subsequent debates and theoretical developments.[9]

I am referring to those chapters of the history of scientific evolution that demonstrate an entanglement of early theoretical categories with human biological experience - and male existential anxieties. And I very seriously recommend that students be familiarized with the hidden roots of many cognitive forms, that they be shown how cognitive forms are often rooted in aspects of the biosphere connected with human sexuality and procreation - and thereby with problems and fears about that part of reality. I am talking about categories of thought that are the scientific predecessors and sometime competitors of present mathematical and scientific categories.

One is not supposed to talk about it, but in every single historical period many males have been extremely afraid of the power women can hold over them, and this is particularly conspicuous in connection with human procreation and human love. The history of the development of the sciences carries imprints of these fears, in all probability in more respects than I can show here.

Today women are less tortured by those older categories of thought (below) than they were in the nineteenth century.[10] Science now usually has better stuff to offer than the idea that all is Sex. The development in mathematics and the sciences has not been all to the worse for women in philosophical respect.

The gist of my argument is this: girls and women are, we said, suffering from the male strategy which I called Lushin's Defense - a total withdrawal into the non-familiar, impractical, non-natural, "pure". Even a life devoted to the technical sciences can be arranged so as to suit this general purpose - to say nothing of a life in mathematics. A girl would presumably fare mentally better if she were taught to see that what I have called Lushin's Defense (or, better, Lushin's No. 1 Defense) is essentially a defense against very real and ***understandable*** male anxieties. And similarly, if she would be taught what other existential anxieties and defensive strategies poor Lushin has been preoccupied with throughout the ages, then his stratagems for coping with them would be considerably less discouraging and depressing.

Some of these stratagems involve concept formation. In fact, surprisingly many of the early central categories in mathematics and in the sciences, too - and not only in politics - turn out to be rooted directly in the experience of biological phenomena, particularly in the experience of procreation and heredity, and in a male-favouring (sexist) anthropology. Whereas more modern categories and theories may well be studied as a ***disentanglement*** from such biological and sexist roots.

For example, the Greek belief in a geometry based exclusively on symmetrical relations - similarity, congruence, identity - suggests a firm belief in the all-embracing importance of categories that are brought to our attention in the phenomena of heredity (as they looked to Europeans before Darwin).

The initial entanglements have to some degree been investigated, but the later disentanglement from biological roots has largely remained unanalysed as such. There is a job to be done here, a new type of textbook to be written that includes this material; for both the early roots in, and the later disentanglement from biological (sexual) categories are, in my estimation, ideal topics for young women's education in exact and natural science. Why? Because such information will presumably take away much of the mystery of scientific category and theory construction. It makes the persons throughout the ages who have constructed scientific categories and theories more human, sometimes perhaps more ridiculous - and so less to be afraid of, but sometimes more attractive as "heroes" - also for women.

Ghetto constructions of the organisation of university life, such as setting apart special courses and subsuming them under Women's Studies, are not required for this educational purpose. In my opinion it is not even desirable. Very many male students turn out to be as interested as their female colleagues in such analyses, and it would be unjust to these men to keep them out.

Nor would it be right to retort that the topics in question are not really crucial to the cognitive evaluation of newer and better theories. Male students, too, ought to be shown how, since Galileo, a growing number of men have tried, not without success, to disentangle human thought from these biology-centered forms of thought and the anxiety-based rationalism that surrounded it. A partial success is undeniable.

That is to say, is it not reasonable to expect that by familiarizing students with this material one can expect to enhance women's confidence in the intelligibility of the cultural world; and so to enhance their inner intellectual freedom and constructive courage? And so to open up for *their* daring theory and machine constructions? (The question whether women's theories and inventions are ultimately likely to resemble men's is not at stake here, nor is the question whether they ought to.)

Is it not reasonable to assume that academic openness about the influence of masculine existential anxieties on scientific category construction can reduce the induced intellectual anxieties in women, at least in sufficient measure to make these anxieties quite controllable? And that such openness in science tuition can bring women's fear of cultural exclusion to dwindle?

And is it not reasonable to assume that such academic openness will contribute to men's awareness of their own existential anxieties, and of how common these anxieties always have been - whereby they become controllable and recourse to extreme strategies superfluous?

These expectations call for a considerable amount of rewriting of courses and textbooks, to start with in logic and mathematics, two fields upon which most technical sciences in some way depend.

I shall give a few examples that I personally find fascinating and to the point. They concern the following (historical) categories of scientific thought:

Direction; Contrariety and "Or"; "Infinitesimal"; Debate; Relations between "logical individuals" (things, persons, ...) as against "Character traits" (of each individual separately).

Obviously I cannot here deal with them in any detail and I cannot here prove the correctness of what I say, for lack of time, but I can give you exact references to published material, should you so wish.

4. First example: A language for a logic of Direction

4.1. Anthropology and the logic of Direction. In classical times one assumed all *relations* of philosophical or scientific importance - mathematical relations, for instance - to be symmetrical. Geometry was set up by the old Greeks in terms of "similarity", "congruence" and so on. And academic logic did not consider relations involving asymmetry and direction until the end of the nineteenth century; with one exception.

The exception was a postulated meta-physical relation of "degrees of perfection", a relation of value based on the doctrine that it was possible for things to "be" of higher and lower metaphysical value, and for man, to *progress to higher and higher value.* Up to about 1900 that metaphysical ladder of progression, that hierarchy of "value", or "real Being", was seen as the only asymmetrical relation that had anything to do with basic categories at all. Other directions and comparatives were totally disregarded, they were held to be of no relevance for the situation at the "higher" levels. The *vector concept,* the notion of a directed magnitude (or potency, or strength, e.g., a force), with components in many different dimensions, was unthinkable throughout the greater parts of the European cultural history - it dates only from about 1800. The concepts *enantiomorphy* and *tensor* are younger still.

Inside the old logical framework of Being and Property - or Substance and Accident - one had no way of dealing with a relation like *A ranks* *higher than B*, or *A is more valuable than B*. For already such simple and familiar vehicles of thought as comparatives - all of them! - fall outside that logical framework. And one had no means of *measuring* this comparative, not even in the weakest sense. Hence there seemed to be no way in which a thinker could communicate his own outlook about metaphysical ranks clearly to other minds - that is to say, not without transcending the logical confinement, known from Aristotle, to objects (beings) with properties.

I shall briefly sketch an early attempt to represent rank, order and direction, as this problem presents itself within a metaphysical theory of values, and to do so without going beyond the layout of beings-with-properties.[11]

One finds this attempt in the works of Philo of Alexandria, a Hellenistic Jewish thinker who lived, wrote and published around the year zero.

In 1970 an American classical scholar and theologian, Richard A. Baer, published a very original book about a certain feature of the general arrangement of Philo's thought. It concerns his remarkably wide use of the categories Male and Female.

"I saw that the categories male and female occupied more than an incidental place in Philo's thinking", Baer writes (p. xi). Philo turns out to use these categories not only for discussing matters of sex, gender or procreation, but often also for other topics.

We can learn from Bear something of interest for our present purpose; for what Baer shows us becomes particularly interesting when studied from a logical point of view.[12] In fact Baer himself does that, in as much as he repeatedly uses expressions pertaining to logic, as "logical order of creation" and "functional-analogical use" (pp. 28, 34, note 4). Philo works within "the philosophical framework of genus and species, potentiality (*dynamis*) and actuality (*energeia*)" (l.c.), and "states that the man corresponds to *nous* and the woman to *aisthesis*."

Aisthesis is the world of the senses, *nous* is reason, "created to rule over *aisthesis* and thus in order of importance logically precedes *aisthesis*" (p. 39).

We are concerned - also in Baer's opinion - with *the logical problem* *of representing order*, non-symmetrical orderings. To develop cognitive representations of order is a logical task, pertaining to each and every field of interest. Things with properties is not all: structure and order occur in all domains of experience and must be represented in the mind and in language, are we to reason about them in a systematical manner. The basic problem of representing asymmetry is the same in the case of spatial relations as in the case of temporal relations and relations of intensity (temperature, strength of material, fields of force).

What Baer has discovered in Philo's texts is his crude, sexist solution to that general problem as restricted to value judgments.

It would not be surprising if you were still nonplussed. "This may be of importance for some," you may now say, "but how can the point that Baer makes about Philo of Alexandria be described as a *logical* point, pertaining to man's earliest attempts to reason and argue logically?"

Argument presupposes mental layout and communication! Philo makes, Baer says, a "functional-analogical" use of the categories Male and Female.[13] A functional use - but of a certain kind: ***he uses these words in order to express the relative ranks of two items standing in a certain non-symmetrical relation, even when the items are not a woman and a man.*** And this is done in analogy with the assumption that the essential Male (whatever that may mean) ranks metaphysically higher than the essential Female. Philo's negative comments about actual women serve, in his written work, mainly as a preface to his subsequent remarks about the perceptible world as a whole: "It is clear, then, that Philo extensively exploits female terminology as a vehicle for expressing his wide-spread depreciation of the created world" (p. 41f, 45.)

The point may be put like this: Baer has seen that Philo employs an ***ordered pair*** of "essences" presumably known to all, <the Male, the Female>, for referential use in a much wider type of discourse than biology and anthropology, namely, for use in connection with ***value judgments about the created world generally,*** of whichever sort, and whatever the items of the comparison are. Although he does not use a logician's vernacular of "ordered pair", or "couple", the classical scholar and theologian Baer has seen what is at stake and has made this historical insight accessible to us all, an achievement for which he definitely deserves our gratitude.

Philo knew that he could employ this usage of "the Male" and "the Female" towards his readers and expect to be understood the way he meant it. The ordering of the items that he had in mind would be understood in the right direction. For Philo could depend on a certain anthropology, familiar to all, that immediately would make all his readers interpret any item called "the Male" as ranking higher in perfection than any item he called "the Female".

But then (we may add) Philo and thinkers like him might as well say *y is the male, and x is the female* in connection with the relation *y is longer than x*, since they can also to a reasonable degree depend on their listeners' knowledge of men's and women's average lengths in order to trust that the relation is understood in the direction he intends to communicate.

Today logic is no longer monadic. The theory of inference we now have works as well for relational predicates like *y is more valuable than x* as for property predicates (like *y is valuable*). Hence there is no need for a reduction of relations between x and y to properties of the one and properties of the other. Hence Philo's technical use of "Male" and "Female" in the theory of values is quite superfluous.

Philo's anthropological conceptualization of the very category that we call Order is in all likelihood the very first published general explanation of the notion of Order in human history. It precedes the first publication on Direction in geometry by eighteen hundred years. And it precedes the set-theoretical definitions of the notion of "an ordered couple" by nineteen hundred and fifty years.

4.2. Vector geometry and vector analysis. From Philo to Caspar Wessel.

For we have, in fact, been speaking about the problem of representing direction. The cradle of vector geometry is the paper *Om Directionens analytiske Betegning* by the Norwegian mathematician and surveyor Caspar Wessel, presented to The Royal Danish Academy of Science in 1797 and published by that Academy in 1799. In 1831 Gauss published an influential publication exposing similar ideas, developed independently.

Philo's thoughts on direction were concerned with metaphysical value and value directedness, that is to say, with direction in a metaphysical hierarchy, *this being the only kind of direction that the former layout of Being in genera and species was conceptually committed to.* The rest was, one hoped, a question of symmetries (similarity, or lack of same) together with non-relational ("character") traits.

The rise of vector algebra, vector analysis and a general logic that can handle asymmetrical relations without resorting to logically intractable hierarchical constructions - this whole development reflects a process of cognitive emancipation *away from sexist representational forms* reflected in the "ecstatic-cathartic"[14] strand of European cognition, so eminently represented by Philo of Alexandria.

Taking this case as an example, I venture to say the following. If students could be given this background to theory constructions, new cognitive instruments would sometimes be experienced as positively welcoming women, they would have the effect of bringing them in from the cold, rather than of condemning them to the cultural exile so many women seem to expect from the sciences. A scientific development like the one we have just discussed could come to be seen as a girl's best intellectual friend, or at least as one of them. It could come to be understood as part of one line of human emancipation, one bit of the slow good-bye to sex-based reason, rather than as a masculine threat alienating women still more from the anti-feminist culture they are borne into. Here, however, scientific education has failed completely.

One final note. It is with a certain glee that I take up Philo's logic here, for when I discussed this in my inaugural lecture as professor of logic at Utrecht university twenty years ago .... Guess what people said to me about it afterwards.[15]

5. Second example: Contrariety and Either-Or

5.1. The sexual origin of Contrariety/Opposition. Already in 1912 the English historian of ideas F.M. Cornford declared the old logical category *Contrariety* to be of sexual origin.[16] "Sex the prototype of Contrariety" is the title of one of the paragraphs in Cornford's book.

("Contrariety": in the history of philosophy this is an ambiguous word. In the early twentieth century, e.g. in 1912, it was usually taken in the Hegelian sense in which it is not distinguished from Contradiction: *at most and at least one of the two*, i.e., as Either-Or, rather than in the simpler Aristotelian sense: *at most one of them*, as in "Sheffer's stroke" in propositional calculus.)

The point Cornford makes - in 1912 - is of an unrivalled importance. In recent years the philosophical understanding of the connections he points to has been on the increase, possibly due to the mental impact of World War II. "Coarsely sexual ideas" - now it is 1975, and the pen is that of the German philosopher Ernst Topitsch - are at the bottom of much traditional concept formation, particularly in "the ecstatic-cathartic line in European theory of knowledge".[17]

In 1990 a book[18] appears by an American historian of biology, Thomas Laqueur, with the misleading title **Making Sex**. It is in fact a detailed history of various concepts "Sex" in Western thought. Laqueur writes that the category Sex has been used as a cipher (a cognitive symbol) for the nature of *causality*, the central concept in epistemology. To this we can add: Sex has also been used as a cipher for the nature of a number of logical categories: for Direction, and, as Cornford pointed out, for Contrariety.

This cognitive category, which we may call Oppositional Sexuality, or Sexual Contrariety, is very old and hard to eliminate once and for all. But it was not typical of Medieval logic, which was relatively advanced, nor was it typical of Medieval biology and conception of gender. The understanding of gender was formed according to the scheme of gradual differences from "the lowest" to "the highest", women being seen as "less male" than men but with everyone given a chance to work upwards, rather than in terms of one biological pair of fixed essences <the Male, the Female>.[19]

However, as Laqueur explains, the earlier bipolar thinking in biological thought returned in the course of the 18th century.

Now this crucial observation about biological categories happens to fit in extremely well with quite independent investigations about the reintroduction in European universities around 1800 of a dichotomizing logic of Contrariety. This Neoplatonic logic is known as the Fichte-Hegel logic. The person who is made especially responsible for reintroduction of this logic is none other than the ultra-sexist philosopher Johann Gottlieb Fichte:

In the nineteen-twenties the mathematician and philosopher Leonard Nelson writes about Fichte's influence on nineteenth-century German *logic* and analyses the nature of his logic. In 1968 Hans Lenk shows that according to Fichte, the concept 'concept' itself is that of *binary exclusive* disjunction. This is to say that, in Fichte's canon, the category Two has a quite unique, premier conceptual status in logic.[20] Not, alas, in connection with truth values - parliamentary values[21]; but at the level of general concept formation and the logical representation, in language as well as in the mind, of one's ideas. In fact there is an exceptionally strong antagonism in the history of ideas between "parliamentary values", or truth values, which pertain to statements, and binary exclusive representation of "beings", pertaining to persons or groups of persons.

In 1975 the truly extreme sexism of German "liberationist" Fichte is documented and discussed by Hannelore Schröder.[22]

The combined criticisms of Fichte as offered by Nelson, Lenk and Schröder strongly suggest a connection between two seemingly unrelated phenomena (three, if we add Laqueur's observation):

1° the upsurge of *extreme sexism* in Germany at the end of the eighteenth century;

2° the come-back of the worst kind of *dichotomizing bipolar logic* in philosophy in that area, and in the same period.[23]

This is more than an incidental coincidence in one man. Fichte is not alone among outspokenly misogynous philosopher "logicians" to exalt the number Two. Another example is WWII traitor Vidkun Quisling, who dabbed in philosophy in secret. Quisling's glorification of maleness and contempt for (and fear of) the female sex can be examined in his posthumous manuscripts. In these handwritten sketches he demonstrates - from his earliest years to the end - a dichotomizing frenzy the like of which I have never seen. Still another example is the Dutch philosopher of mathematics L.E.J. Brouwer, who talks of "the intuition of two-oneness" and calls it "the primordial intuition of mathematics".[24] Hence for this man - not speaking with the authority of a psychologist - the number Two is more "intuitively primordial" than for instance Three. Though it has been kept hidden from the international readership, it so happens that Brouwer was every bit as fanatical a misogynist as Fichte, in this respect worse even than Quisling.

5.2. Backlash? I like to briefly mention that it is possible to see Fichte's reintroduction of this type of Neoplatonic logic at the German universities (from which it spread like a plague) as a backlash - in an attempt to exorcise "the Feminine" and thereby squelch the existential anxieties and hysterical fears of women's voices, and possible voices, raising perspectives that could make the entrails of the souls of men shiver. It is largely a matter of chronology. Fichte's two books on logic and epistemology, *Über den Begriff der Wissenschaftslehre* and *Grundlagen der gesammten Wissenschaftslehre*, were written *and* published in 1794. Look at this (incomplete) sequence of years of publication of works by eighteenth-century women philosophers:[25]

1701, 1751 Catherine Cockburn Trotter
1704, 1705 Mary Astell
1705 Damaris Cudworth Masham
1720 Jeanne Dumée
1738 Maria Agnesi
1739 Sophia (pseudonym)
1740, 1741, 1744, 1759 Gabrielle Emilie le Tonnelier Breteuil, Marquise du Châtelet-de Breteuil
1742, 1752 Dorothea Christine Leporin-Erxleben

1767 Johanna Charlotte Unzer
1767, 1787 Catherine Macauley-Graham
1787 Dorothea Schlözer
1788, 1789, 1792 Mary Wollstonecraft
1791 Olympe des Gouges (Marie Gouze)
1799 Mary Ann Radcliffe

It was unheard of. These women could write. Worse even - it was clear that they could think. They could reason. And some men got hysterical.

And changed the categories of biology and logic.

5.3. The inclusive Or is clearly not inspired by the two sexes and the supposedly unavoidable "contrariety" between them. It is the logical category that in Aristotle is called Subcontrariety: *at least one of them.*

This inclusive Or has been discussed in the Middle Ages, in the works of William of Ockham. Then it disappears completely from European scene of published philosophy. It does not return until the nineteenth century; then another Englishman, Augustus De Morgan, reinvented or rediscovered it. De Morgan's plea for an inclusive rather than an exclusive Or was taken up by his sometime student, the economist W. Stanley Jevons.

And they won. From the representational systems offered by logic nowadays, whether in England, Holland or in Germany, the emphasis on exclusive disjunctions, on Either-Or, is gone. So in this case, at least, there has been a change for the better - away from the nineteenth century's emphasis on binary gender-based "Contrariety", "Opposition", *"Gegensatz"*.

Most people in logic in the academic world do not realise (and usually do not care) what this logical shift means in human and cultural terms. But that certainly is no reason why we shouldn't, or why our students shouldn't be brought to understand the kind of cognitive turnabout this has meant.

After World War Two a new upsurge of old anxieties could be seen in many countries. Such existential anxieties as the war brought with it - in Germany, deeply wounded male pride, combined with wounded national pride, after the loss of yet another war - explain why in the 1950's and 60's there was a plea, strongly polemical, precisely in Germany for the reintroduction of the exclusive "Or". *Either* Male *or* Female, *either* Friend *or* Foe. This was claimed to be the "most important", the "philosophical", understanding of "Or", pertaining to *any* concept or domain of application whatever.[26]

Whereas, in the meantime, logic had discarded this dichotomizing and polarizing particle as, mostly, grossly misleading for the representation of the outer world. In scientific and philosophical description other representational forms had taken over.

6. Third example: Mathematical Analysis

6.1. Infinitesimal calculus and General Value theory. At the beginning of this talk I mentioned some existential strategies, and among them a desire many men have to establish themselves as belonging to a world that is situated at great distance from the familiar world.

"Infinitely" far away, if that is possible! "Actual infinity" has been a great favourite among thinkers with a mathematical bend. What I should like to discuss next concerns a cognitive category related to this need: that of "the extremely small", the Infinitesimal - another favourite of many men. In the old metaphysics, weight, spatial extension, and quantity generally were associated with Matter and the Female. Power, therefore, resided in "the extremely small", that which had no weight, extension or quantity.

My third case story concerns the origins of the Differential and Integral Calculus, or "the Calculus", for short. This cognitive apparatus was developed independently by Leibniz and by Isaac Newton, from different basic categories. In its German inception that smart conceptual apparatus was concerned with *extremely small entities*, or *"Infinitely small magnitudes"*, and so it was called the "Infinitesimal calculus".

This cognitive category, the Infinitely small, was not originally invented for the benefit of mathematical physics. Far from it; for on the European continent it had for a very long time been part and parcel of the categorial apparatus of human cognition. You find it in old theories in many other scientific, pseudo-scientific or cultural fields than mathematics and physics.

In fact, the cognitive category Infinitesimal started out, just like Direction, as a category *within the traditional metaphysical theory of value.*

(1) You find this old cognitive category of "infinitesimal things" in the pictorial arts, in the strange reverence people in certain centuries had for miniature paintings. The point is that such paintings were assumed to have an especially high value due to their very smallness.[27]

(2) You find it in homeopathy, in the homeopathic doctrine of how to produce valuable, potent medicine. Homeopaths insist, without offering any explanation, that in order to attain its power the medically active ingredient must, if it is a solid, be ground into a very fine powder; if it is a fluid it must be diluted, until the chance that you find as much as 1 molecule in a spoonful of the dilution is lower than Avogadro's number, 10^{-24}.

(3) I claim that you also find it in Anorexia nervosa. The afflicted persons are mostly young women who try to lose as much weight as possible; some are prepared to die from loss of weight, rather than have anything like a normal human mass of flesh and bones. Why?

These persons seem to me to act on a certain assumption that is stored somewhere deep inside their brains, the assumption that the smaller and closer to absolute weightlessness, the better. Why again?

Therapists today seem to agree that anorexics are trying to achieve some kind of power, that Anorexia is - in feminist terms - geared towards self empowerment. That is to say: *Small* is, for them, *Powerful.*

Anorexics do not themselves express this. But neither did Samuel Hahnemann, who founded the homeopathic school in medicine, nor do his followers. *Why* does neither group attempt any kind of explanation for their fascination with weightlessness? Why didn't Hahnemann formulate this earlier principle of European thought? And why don't anorexics formulate it?

Because it concerns a certain strand in European cognition, a certain mode of thought, a cognitive principle that is taken for absolutely granted, like elementary arithmetic.

It is possible to give an explanation to all of these three mysterious subconscious cognitive attitudes or beliefs. My thesis is this. Perhaps in all of mankind, but at least in Europe, human cognition has developed on a basis of a deep respect for *seed*, of any kind. Vegetable seed, grain in particular, and still tinier plant seeds, all clearly possess power. From an early moment in the history of mankind it must of course have been clear to anyone that human life depends in large measure on the incredible powers of tiny little plant seeds. That seed is powerful is undeniable: whole plants, enormous trees sometimes, with eatable leaves and fruits on them, develop from one little, almost invisible thing!

Richard Baer (above) has done women a great service in pointing out the sexual origins of certain types of human logical vernacular. But don't forget that an older Von Baer, the German medical man from Estonia, was the first to discover and publish (in 1827) that humans and dogs and lions also produce *eggs*. One need not be a bird to produce an ovum! And so von Baer had proved, by means of keen observation, that *not only the males* in the human species were active participants in the process of conception.

Whereas until then, no knowledge of mammalian eggs being available, "everything was born from seed", and from seed alone. Seed - *terribly small things* - held all the power.

Deep in your brain, Power may then easily come to seem inseparable from smallness, to require, even to *mean* smallness, thinness, weightlessness. And if that is so, self-empowerment *requires* loss of weight. There is no way around this (automatic, unconscious) "conclusion".

6.2. Weierstrass. Now what about the Calculus, on the European continent for a long time called "the Infinitesimal Calculus"?

As many of you will remember, in school or university courses the word "infinitesimal" was hardly ever spoken, the old name of this branch of mathematics notwithstanding.[28] Instead one learns about *limits* of series of fractions *delta y : delta x*, for decreasing choices of *delta x*. Here, not only are *x* and *y* themselves ordinary real numbers, obeying the same arithmetical laws as all other reals, but *delta x* and *delta y* are plain real numbers as well. They are not something special, called "infinitesimals". And you may remember that this came about because around 1900 a certain mathematician, Weierstrass, had managed to reconstruct the said Calculus from concepts that had no connection with that old category: the (potent) Infinitesimal. Instead he appealed to Cauchy's notion of the *limit* of some decreasing series.

What does this mean?

That the Differential and Integral Calculus can be studied, taught, and used with no reference what so ever, direct or indirect, to seed.[29]

"A pity," you may now say. "I quite like the idea of seed, and the cognitive category of Seed, at least I like it *much* more than that chilly and difficult mathematical notion of Limit. Seed *is* important, and it may be male, but *at least it is human*! That forbidding category called "Limit", on the other hand, seems to be a part of exactly that closed abstract world to which, as you said, nervous males take refuge in order to forget the realities of life. So what's the big deal?"

6.3. Weierstrass in dialogical terms. Is Weierstrass' theory "chilly", you said? And did I hear someone say the other day that, *being formulas*, these formulas *ipso facto* are "masculinistic"?

Let me tell you what happened next in academic logic. The scene is still Europe. Based on work done by the Dutch logician Evert Willem Beth in the nineteen-fifties, a German logician, Paul Lorenzen, in 1960 was able to show that (in my terms) *modern logic need not be seen the way the boys with the strongest existential anxieties prefer to look at it:* as a refuge from the daily world, with its physical and political terrors and the risks posed by the existence of women - a domain of pure mathematical abstraction. Thanks to these two logicians it is now clear that modern logic is not that old theory of Being, so dear to dogmatists of all hues. On the contrary! It can now be seen to consist of collections of rules precisely for dealing with certain types of disagreement about the physico-political world in an undogmatic and *non-violent manner*, through unprejudiced dialogue and critical discussion.[30]

And this does not mean the kind of "discussions" we women are so often treated to by haughty anxiety-ridden men, inside and outside the universities. We are talking instead of person-to-person discussions between equals, where the topic is announced in advance and where no one can rightfully hold you back or even force you to participate.

Serious, but orderly and polite discussions with other humans, including women: is this not precisely what so many men have always been so terrible afraid of?

Yes, it is one of the things that many men have always feared more than of anything else. Excellent examples are Carl Schmitt and Vidkun Quisling, Nazi's of world renown. Or take the "intuitionist" mathematician L.E.J. Brouwer. One did not discuss; as Male, one *acts* and *creates*. To say nothing of discussing with women - the very idea made them sick.[31]

So what again? Were we not talking about Cauchy and Weierstrass and their darned mathematical doggedness, their constant circling around the Differential and Integral Calculus?

You see, I now combine the two: the Cauchy-Weierstrass rendering of the Calculus, without "infinitesimals" with their historical roots in Seed - and the (Beth)-Lorenzen rendering of Logic itself as the theory of critical discussion. And what do you get?

You get a dialogical interpretation of Weierstrass' set-up of the differential and integral calculus. When reformulated in critical-dialogical terms, Weierstrass' famous formula:

"For each ordinary ("real") number, call it **e** (epsilon), *there is* an ordinary number, call it **d** (delta), such that ..."

(and so on), penned down in the *is*-based terminology characteristic of the nineteenth century, now attains the following profile:

"You seem to doubt what I say about how to calculate the derivative $f'(x)$ of the function $f(x)$, and its value at x.

However, **you** may set a tolerance for the error I may make concerning the value of $f'(x)$ at x in practice (that concerns, say, the dimensions required for the safe construction of a certain aeroplane or bridge)!

For I hold that, for **any** tolerance of an error (**e**, or epsilon) of mine that **you** may set, as long as it is a measurable size, I can pick a rational number (**d**, or delta) such that - and I can show it to you if you so wish - provided the free variable's deviation from x is smaller than **d**, my estimate for the value of the derivative will always be within the error **e** that you will tolerate. And so there is no danger as long as we remain well within this distance **d** from x."

6.4. Debate-inter-pares or monological Reason-at-a-distance? We have studied a slow cognitive change from a theory in terms of potent male seed, highly discouraging for women, to a theory in terms of the debatability of claims (pronouncements), in a debate among absolute equals. There is no threat. There are no popes. Exclusive disjunction is gone, social contrarieties immobilized. In the theory of the exact sciences there is no division of the sexes. Logical opposition is not social opposition, the opponent is not attacked, only his or her statements.

In *logical* theory, and in *logical* practice, you are now *inter pares* - among equals. And as for mathematical theory, even Weierstrass' definition of limit can now be reformulated in terms of **You** and **Me**, your tolerance as to my possible error and my way of tackling that tolerance. Gone is the category of Absolute Seed, with its infinitely small size, or sizelessness, as one should really say, and its power.

Gone, too, is the implicit reference to the assumption of only one human procreative component, or sex. The philosophical category of Reason was, in fact, the category of men's Reason-at- a-distance-from-women; this category is now replaced by - no, it has *developed into* - the category of Reason as Debate *inter pares.*

In the mental programme determined by the category Infinitesimal, the fundamental mental category *Power* logically implies, we said, lack of quantity, including weightlessness. Self-empowerment therefore logically implies, and so in practice would seem to require, loss of size and weight. The English philosopher Berkeley hit the nail exactly on its head when he criticized the mathematician's "infinitesimals" as the "ghosts of departed quantities". *Anorexics are persons who try to become mere ghosts, of departed bodily quantities.*[32]

Now suppose our culture would understand what is cognitively at stake here, and suppose it would care about it. Then the terrible affliction of Anorexia would be quite pointless. It would not be needed from *anyone's* point of view. Nor could it be communicated to others - as it still is, in strange and secret and subconscious manners of which we today have no survey.

What would have come into our culture instead?

A penetrating emphasis on dialogue, sometimes on debate - always ridiculed by Reasoners-at-a-distance - maybe highly critical, but among equals. I believe that feminism as well as parliamentarism would be pleased with such a replacement.

The analysis of mathematical functions from Cauchy to Weierstrass meant a cognitive emancipation process from ideas that have roots at the deepest mental levels. In my opinion the men who carried it out deserve our gratitude and enthusiasm, although those roots were not all eliminated.

There is no need for women to feel left out as a consequence of *that* cultural development. I want women at the universities pondering their differentials and integrals to be able to experience it as an intellectual feast - not because of any godlike abstractness inherent in the theory, but precisely because of its restructuring as a non-mythical, non-mysterious instrument allowing the construction of useful things while encouraging discussion about claims to their practical worth.

7. Fourth example: Good-bye to isolated individuals

7.1. Shift to relational! Philo's use of the categories Male and Female depended on an anthropology, still much alive and operative, that deals with *"the"* Male, *"the"* Female, as such and such a *character type*, and that in theory describes any individual male and any individual female by his or her similarity to a so-called genus, "the Male" or "the Female", that epitomizes this "character". An anthropology that judges every individual male or female one at a time, and that hence recommends an official logic (e.g., Aristotle's logic) that can deal only with such one-by-one judgement. Direct comparison is then comprehended only as between one individual and a genus or character type, never as a straightforward comparison of two or more individuals.

What is called modern logic is found nowadays (with exceptions) in the heart of the exact sciences, most of the natural sciences and, though unknown to great parts of practical life, in increasing measure also in the social sciences. It encourages you to compare two or more individual things in the empirical world - humans, forces, or whatever - directly with one another, without a detour via "genera". This feminists, at least, ought not to disregard, for it can be put to work so as to obtain a tremendous practical import.

7.2. Strategical serendipity: Good-bye to judgement by Character! Let me mention one extremely important field of judgment where norms issuing from older logical habits are still taken for granted and new norms are called for. This is the evaluation of candidates for academic and other appointments, when some of these candidates are women. I do not have the time or space to sketch the norms that are commonly in use and confine myself to a formulation of a new norm, a "counter-norm" compatible with theoretical academic logic in the twentieth century.

Counter-norm No. 1 (for members of appointment committees, for positions at any level, wherever:)

Do not ask whether a woman *has undesirable personal qualities (traits, characteristics).*[33]
Stronger still, don't ask whether she has "properties".
Instead, do this: first read, of re-read, in case your committee will also have to judge the qualifications of women, Elaine Showalter's book *The Female Malady.* Then you may begin to understand something also of the situation of women on the labour market and in our time.

Thereafter, ask only whether the woman concerned unquestionably *has displayed* **even worse** *behaviour than X (has behaved* **even more** *dishonestly than X, even more deviously, shyly, or brazenly, or looks more power-driven, or whether she would be an even worse Manager/Director/Dean of Faculty, than X),* where as values of *X* one successively takes the names of the five most impossible and regretted men employed in the department.

Never ask, and never respond to a question whether a particular woman is "**suitable** for a directorship/professorial chair", or similar questions. Ask and respond only to the question whether this individual woman is **as suitable as the least capable** male director/professor was at the moment of his appointment in your corporation or faculty.

[*If you have ever used or are unwilling to completely abstain from thinking in terms of "character" and "traits":*

Encourage the empirical study of so-called *character features (traits), uses of language, managerial style, and other "personal features"* of **each male employee**, of all ranks, in all economic sectors that you are able to affect. Carefully investigate how they *de facto* have spoken and acted on local and national boards and committees. Investigate whether the minutes are in principle traceable and findable; if they are not, the faculty in question is to suffer a serious budgetary cut. The Ministry of Science and Education should contribute a rather large sum in order for this research to get a good start.]

Further the appointment to full professor of every woman with a doctorate who might so wish, *provided her scientific production is* **no worse than** *that of* **the least talented** *man when he was employed in that rank*. And make similar formulations for other ranks and industries.

The second of the strategies I recommend is to work towards the acceptation of the logic of **comparative over-all evaluation**, or, **"better-than-the-worst" evaluation**, as defined by Counter-norm No. 1, and to see to it that a norm more or less like No. 1 is incorporated into our employment culture for as long as women are not as strongly represented as men.

8. Whose textbooks?

Such things I believe to be of importance to each woman student. But then there is the question of who writes the text-books. Is it encouraging to female students that they are *all* written by men? This I don't believe, however excellent many of their books may be. There ought to be some exceptions (at least). So my third strategy recommendation is: see to it that there are some exceptions. But how to find them?

This is a question that in my opinion deserves much, much more attention.[34]

[1] Bold letters are used for terms that function as technical terms in this paper. Italics as usual.

[2] Cf. Walter J. Ong, **Fighting For Life: Contest, Sexuality, and Consciousness**, Cornell U.P., 1981

[3] Which, it seems to me, is backed by Nancy Chodorow, Walter J. Ong and several others (including myself).

[4] A communicative ("dialectical") field concept is developed, with due reference to Kurt Lewin, in: E.M. Barth, **Dialectical fields and transformations: Brouwer fields, Beth fields, and Naess transformations**,
Philosopia Naturalis 21 No. 2-4, 425-34.

[5] In Practice, "pure" - as in "pure mathematics" - may seem to mean: not aimed at direct applicability. Emotionally, however, it seems to mean "at a distance from the space inhabited/inhabitable also by the other sex". - For an illustration, see the low value assigned to civil engineering in **Leven, Kunst en Mystiek (Life, Art, and Mysticism)** by the Dutch misogynist L.E.J. Brouwer (1905).

[6] It seems to me that this existential need and its solution will be involved in all educational measurements of interests and proficiency, somewhat like cosmic noise in many parts of physics.

[7] Cf. Section 6.3 below.

[8] Vladimir Nabokov, Berlin 1930, in Russian; the title translates as **Lushin's Defense**. First complete English book edition: **The Defense**, 1964.

[9] And of course into political science as well, but that is - perhaps? - another topic.

[10] Barring those who suffer from Anorexia nervosa (if my hypothesis in Section 6 turns out to be correct).

[11] More precisely, within a *monadic* logic with an associated metaphysical theory of values.

[12] Richard A. Baer, **Philo's Use of the Categories Male and Female**, 1970.

[13] For example, "Philo's use of the categories male and female in reference to Areté, Sophia, and the Logos is purely functional, never ontological" (p. 66). In other words, he does not mean to say that Areté, Sophia and Logos *are* females or males. "Rather, they are thought of as male or female only in terms of their functioning as active and dominant, in which case they are considered male, or passive and receptive, in which case they are described as female. Therefore to speak of Sophia or Areté as androgynous is misleading. At this point Philo differs substantially from most of the Gnostics. For Philo, the categories Male and Female function *within* the realm of creation" (l.c.).

[14] See Below.

[15] In fact, none of the men dared to say anything whatsoever, not even my best friends and colleagues. It was before such things could be spoken about without painful embarrassment. The only philosophy colleague who reacted to that inaugural lecture at all was Professor C.W. (Cornelia) de Vogel, in classical philospphy, who regretted my not having mentioned the sexism of G.W.F. Hegel.

[16] F.M. Cornford, **From Religion to Philosophy - A Study in the Origins of Western Speculation**, 1957 (1912): "Sex the prototype of Contrariety", p. 65-72.

[17] Ernst Topitsch, **Die Voraussetzungen der Transzendental-philosophie**, 1975.

[18] Thomas Laqueur, **Making Sex - Body and Gender From the Greeks to Freud**, Harvard University Press 1990. The title means: forming the concept, or concepts, of "the sexes".

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[19] The disappearance from the *logic* of modern science of this hierarchical way of bringing about conceptual connectedness seems to be part of what has inspired Carolyn Merchant to her book **The Death of Nature - Women, Ecology and the Scientific Revolution**, 1980. My thanks are due to Renée José Dalitz for bringing this (strange) book to my attention.

[20] L. Nelson, **Sämtliche Werke VII: Fortschritte und Rückschritte der Philosophie**, posthumous publication ed. by J. Draft, 1962. Hans Lenk, **Kritik der logischen Konstanten**, 1968, p. 196f, 213f.

[21] The use of truth values, and of flip-flop representation in electronical data representation, is another matter entirely. We have been talking here of logical representations of the object fields of the sciences (and the humanties), the immediate descriptions of "what there is", in natural or in mathematical languages. I mention this on account of a remark made after my talk by one of the participants.

[22] Hannelore Schröder, **Die Rechtlosigkeit der Frau im Rechtsstaat**, 1975.

[23] Fichte's antisemitism could be added; see Paul Lawrence Rose, **Revolutionary Antisemitism in Germany - form Kant to Wagner**, Princeton University Press 1990.

[24] Walter P. van Stigt, **Brouwer's Intuitionism**, North-Holland (Elsevier Science Publishers B.V.) 1990; p.149, 305.

[25] From: **Women Philosophers Through 1990** (note34).

[26] Cf. books by G. Jacoby; B. Baron van Freytag; Carl Schmitt (see note 31).

[27]There are papers on this by Dutch art historians Elly Cassee and Sam Dresden.

[28] There are some exceptions. As A. Robinson has shown, it is possible to define a concept (say, "Neo-Infinitesimal") in abstract model theory and to use it in a way that has some - though by far not all - features in common with that of the old notion, without running into contradiction. However, that approach is not needed for anything in particular or otherwise particularly valuable, so that even today the term is superfluous.

[29] "And hasn't Abraham Robinson showed ..." (and so on). No, he didn't - he did *not* inaugurate a return to the category of Seed as a category for power and potency. He dealt in mathematical model theory, and that is not the same. Force and energy still are physical categories.

[30] This is of course not meant to suggest that this instrument is a panacee for all disagreements and conflicts, which wourld clearly be a quite preposterous claim. Many additional instruments are needed.

[32] See for instance Nicolaus Sombarts mesmerizing study **Die deutschen Männer und ihre Feinde: Carl Schmitt - ein deutsches Schiksal zwischen Männerbund und Matriarchatsmythos**, Carl hanser Verlag, Munich/Vienna, 1990.

[32] Weird as this theory may seem today, it is, I would think, amenable to empirical exploration by cognitive psychologists.

[33] See the keynote paper by E. Kvande, this conference (manuscript, p.3), on "the 'trait' approach" - "where certain *characteristics* of managers are seen as an important element of leadership theory".

[34] As to philosophy, information enabling teachers to compose new programs for students may be found in my **Women Philosophers - A Bibliography of Books Through 1990**, Philosophy Documentation Center, Bowling Green, Ohio, 1992. In additon to ethics, epistemology, logic, metaphysics and so on the bibliography includes also the philosophy of mathematics, of cosmology, and of the physical sciences.

A DECADE OF CONCERN: THE GASAT EXPERIENCE

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Rector, GASAT colleagues and friends: I am honoured that you asked me to speak here at the University of Technology, Eindhoven, on the topic 'A Decade of Concern: the GASAT Experience', for it was ten years ago that I was here in Eindhoven, helping to put together the report of the first GASAT conference. But you have set me a difficult task. Ilya Mottier orientated our thinking skilfully and comprehensively at the beginning of this conference by raising questions from that experience. We have since spent two days of intensive listening and discussing on selective issues. Perhaps it will be of value to reflect once more on the dimensions of the problem we are addressing.

The GASAT conferences are a product of the 1980s. On the one hand the twentieth century women's movement had focused attention on equality of opportunities in the widest sense; we were in the middle of a UN Decade for Women and one by one countries were introducing some form of equality legislation. On the other hand, in the West, science educators were left in no doubt of the unpopularity of science, especially physics, as young people, many males as well as most females, avoided their study as soon as they had the choice. Added to these concerns were those of industry and governments over the shortage of skilled personnel; these last factors favoured funding of intervention projects.

A number of people, in various parts of the world, had taken initiatives to encourage more girls to study science. The first conference to bring such people together was made possible, in 1981, by a generous grant from the Dutch Government. It was held in Eindhoven and coordinated from the Technical University by Professor Jan Raat, assisted by Ilya Mottier, from the Ministry of Education and myself, from the UK.

GASAT then stood for Girls and Science and Technology. Papers submitted for the conference focused largely, but not exclusively, on girls' experiences of science and how these related to later participation (or lack of it) in science and technology careers.

How was the problem perceived? We challenged the easy assumption that girls were the problem - that they needed only to be better informed and more effectively counselled to choose science and its related careers. You will see, if you have access to the reported 'Proceedings' of that conference, that the complexity of the problem was already apparent. Three interacting sets of factors, influencing how it was with girls in science and technology in any one time and place, were identified: the philosophy, aims and organisation of education; the expectations that a society has of its men and

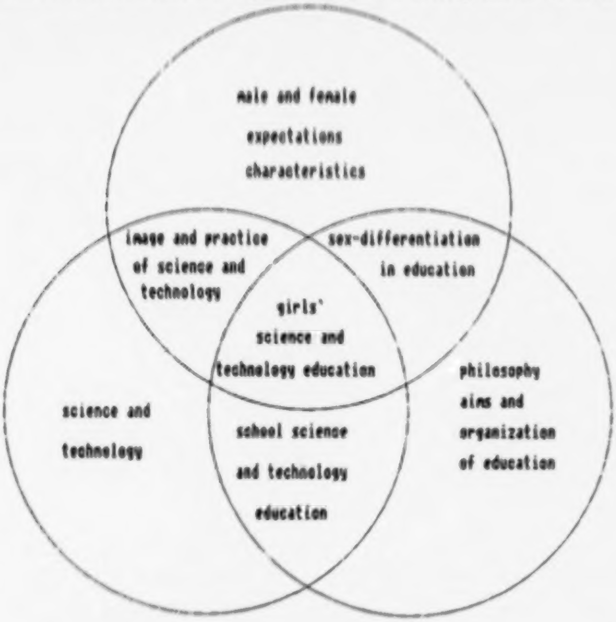
male and female
expectations
characteristics
image and practice of science and technology
sex-differentiation in education
girls' science and technology education
science and technology
school science and technology education
philosophy aims and organization of education

Figure 1: Interacting factors in girls' science and technology education

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women, girls and boys, and the characteristics they develop, and the perceived roles and the practice of science and technology in the world, and the manner of their presentation for learning (see figure 1).

I will expand a little on these three groups of factors, drawing upon the inputs to GASAT Conferences. I will have to be very selective: there have been around 500 papers prepared for GASAT Conferences and in no way could I attempt to do justice to the richness and variety of understanding of, and approaches to, the problem that they contain.

Taking the school system first, we recognised the consequences of differences both for our perception of the problem and what intervention was appropriate. For example, in Western Europe access to many higher level education courses, and professions, require high level school qualifications in physics, whereas in the US a college entrant could begin the serious study of physics, provided she or he had an appropriate grounding in mathematics. Hence the concern, in the US, for women and mathematics and the many interventions at the tertiary level and in informal education to orientate young women to science. In the UK, the failure to choose physics at age 14 formed an effective barrier to many professions. Our concern that all young people should follow 'a broad and balanced science course' has been incorporated into the National Curriculum in the UK, but, since it is still possible to choose between doing one or doing two units of science between the ages of 14 and 16, we still have to monitor for the consequences of this choice.

Evidence came from Norway (Skog, 1983) and Australia (Parker, 1987) that when greater choice was introduced, sex-stereotyping increased. On the other hand, it was reported from Thailand, where all young people have to study some science to the age of 18 (and those who choose the science line all follow the same physics, chemistry, biology and mathematics courses) that girls do as well as, if not better than, boys (Klainin et al, 1987). We hear from our Eastern European colleagues, at this conference, that similar conditions have existed in their countries.

Secondly, in most societies, sex stereotyping of qualities, values and activities carries with it a heavy historical weight. Equality policies may be published by governments, employers and education departments, but expectations are slow to change. Moreover, as Gunn Imsen (1985) reminded us, at GASAT 3, the rhetoric may be changing but patriarchy is alive and well and flourishing in the modern world. We see it in the predominance of males in government, in senior personnel of institutions, and in the persistence of structures and processes derived to match men's life patterns and needs in fields that are now nominally declared open to women. Wagner(1985) reported the ambivalence generated in young women starting out in technical employment: they were proud of the skills they were developing, but troubled by the masculine persona they were required to adopt.

Problems arise in programmes conceived as more 'liberal': we wish to provide freedom of choice and to encourage young people to exercise decision-making skills, but if sex-stereotyping exists in any form within the society this will exert a pressure on the choices made. A paradox then arises: to give greater freedom later, we may need to limit earlier educational choices.

Thirdly, we turn to the image and practice of science and technology. How is science perceived at school level? Young children drew scientists as men (Simpson and Girdham, 1987), girls reported much less time spent with science-related toys and activities out of school than did boys (Rennie, 1987) and this could correlate with a lesser success in related formal science in school (Lie and Bryhni, 1983). Science (and especially physics) was seen as difficult, masculine, abstract and unrelated to everyday life.

Intervention projects, such as GIST (Girls into Science and Technology) (Smail, 1983), MENT (Meisjes, Natuurkunde, Technick) (Raat, 1981) set out to change this, and girls' involvement, by relating science to girls' interests and experiences as well as boys', in particular science was related to the social context. The McClintock Collective in Australia explored the use of drama, role play and creative writing in presenting and recording science. (Hildebrand, 1989) In a Danish project young people were encouraged to recall any links to previous experience when faced with a new topic and to explore the feelings it aroused for them. (Vedelsby, 1987). Most projects worked with teachers, both to extend their understanding of the problem and to develop skills in presenting science differently.

We have learned that intervention is most effective if sponsored by senior personnel and supported by grass roots commitment. In spite of the complexity of factors operating on the choice of science, some careful researches have attempted to generate models to guide intervention. Hildebrand (1987) put forward an early model; another, developed alongside the MENT project, was presented by Alting (1991) at Melbourne and Eccles (1992) has presented her model, developed in the US, at this conference. All emphasise the multiplicity of factors involved and, by implication, the risk of failure if intervention addresses only one factor.

Technology education is particularly problematic. GASAT 1 focused attention on the negative image children in Sweden had of technology (Lindholm, 1981); they drew pictures of devastation, with people fleeing from the picture. The PATT project has further investigated attitudes and made recommendations for curricula (de Klerk Wolters et al, 1987). One problem has been the association of technology with earlier workshop-based craft subjects used almost exclusively for boys. Home economics has not so readily been accepted as technology although (Mottier, 1985) described attempts to integrate home economics into technology education in the Netherlands, and Sweden has done this for many years.

The present uncertainty about technology in the National Curriculum in the UK is partly caused by the failure of the Engineering Council to recognise a 'home economics' contribution to technology education. Even some who support its place do so because they see it will provide something for the girls to do!

More positively, everyday technology has been used as a vehicle to empower women who have missed out on earlier science and technology education. AnnMarie Israelsson's development of the Tekinkens Hus in Luleå has been an exciting project to follow for GASAT participants, who rejoiced with her over its opening in 1988 (Israelsson & Nordell, 1990) * Harding, J. (1992) has used the technology of fabrics and their care to develop some understanding of basic chemistry with rural women in the UK.

All aspects of technology education, whether directed towards technological awareness, literacy or capability, have gender interactions which will need to be addressed.

Engineering education has featured strongly in GASAT conferences. A number of projects encouraging young women into engineering education and supporting them there have been reported (Daniels, 1987; de Raaff, 1981). The entry of older women has also been facilitated. (Anderson, 1983, 1989, Chivers and Swarbrick, 1985 and Swarbrick, 1991). A network linking projects in the US has been established, WEPAN, with a proposal to extend internationally.

But we have asked why?, why are we concerned to get women into science and technology? Are we responding only to the skills shortage syndrome? If so, we are right to be suspicious, as Ilya warned us to be, for women may be the first to be rejected when the shortage has been made good.

There are positive reasons, for women themselves, to consider in the two areas of living and working. Where women feel alienated from science and technology they also experience alienation within a culture increasingly dominated by these fields. It becomes a mental health problem for them. Additionally they lack the confidence to contribute, in a democracy, to decision making about developments in science and technology. They become second-class citizens. We need to reclaim science and technology for 'ordinary' women.

* *(see also the workshop report in this volume)*

There are also positive arguments for wanting more women to work as scientists and technologists. These relate to financial advantage for women, advantages for science itself and for the impact of technology on the world.

Where well-paid work exists for those with skills in science and technology it is not morally right that women are excluded from this work by differential expectations and sex-stereotyping. This is an important argument in the US and is used against protective legislation specifically for women. If work is hazardous, then people, both men and women, may need protective legislation.

The advantages to science and to the world arises from a consideration of values. Modern science has developed within cultures in which different values, roles and expectations are mapped onto men and women. Men are expected to be ambitious, to develop leadership, autonomy, dominance and control. Abstraction and so-called objectivity are characteristics of their thinking. On the other hand, women are expected to be nurturant, and submissive. The nurturant role enables women to be in touch with many more aspects of the social and physical environment. They appear to be more tolerant of ambiguity and less readily disregard context. I believe the practice of nurturance generates humility, a characteristic absent from the expected behaviour of men.

Because men have formed the majority of persons involved in the development of science and technology, the values and characteristics mapped on to women are not strongly represented in their practice.

The nature of engineering education and the values embodied in it has been questioned insistently in Denmark (Kolmos, 1987, 1991) and further explored via a symposium at GASAT 6. The whole thrust of the first Euro GASAT Conference, held in Denmark in 1986, was 'Women Challenge Technology'.

At GASAT 4 our attention was drawn to the writings of Evelyn Fox Keller on gender and science. Her analysis of modern science as masculine focuses on not only its historical origins, but also the creation of male-ness in men through nurturing and expectations (Keller, 1986). She suggests that this process generates specific emotional and cognitive characteristics which interact with the practice of science. One such characteristic is the need to be in control and may lead, she suggests, to the dominance of 'master molecule' theories in biological systems and an inability to tolerate ambiguity which leaves unresolved the nature of electromagnetic radiation. Could science be different if more women were involved? Else Barth, on Monday, presented a similar analysis in the fields of mathematics and logic.

Questions relating to the possibility of a feminist science were considered at GASAT 6:

-do women practise science in a different way? Fox Keller uses the life and work of Nobel Prize Winner, Barbara McClintock, to illustrate her argument (Keller, 1983). McClintock, herself, denied she worked differently, but Keller claims she was able to 'see' the transportation of genetic material in the 1950s precisely because she was a woman, unwelcome, at the time, within mainstream science so that she escaped socialization into male ways of thinking and could use individual-istic methods of enquiry. These happened to be nurturant, showing humility in the face of the material she studied. She used phrases such as 'let the material speak to you', 'let the material tell you what to do'.

At GASAT 6 we heard from a woman professor who had her own research programme, in a Canadian University, in the field of forest genetics. She told us she was closing her research laboratory as she could no longer identify with the mores and ways of working in the field. The major thrust in forest genetics has become 'how to improve trees'. She rejected the arrogance of this position.

These women were bringing different values to bear in the practice of science. They were perhaps generating knowledge in a way different from that in the dominant, masculine ideology.

-is there a feminist science? Sandra Harding fails to identify such a science, but in a paper enquiring into feminist methodology (Harding, S. 1989) identifies three characteristics of 'good' feminist research: use of gender as an analytical tool (using the gender lens); recognition of women's experience as valid evidence in scientific research; and use of a robust gender-sensitive reflexivity.

-is a feminist science a desirable/valid objective? We may accept the analysis of modern science as masculine and see it as a distortion, constraining science. Would a 'feminist science' create a similar distortion?

-should we aim (as McClintock and Keller prefer) for a science in which the question of gender drops away?

Whatever emerges from this questioning it is essential that we go on using gender as an analytical tool as we work within science and technology, attempting to understand and to improve the position of women.

It is not surprising, therefore, that at GASAT 4, a decision was taken to replace the 'G' for 'Girls' by the 'G' for 'Gender'. Also at GASAT 4 we resolved to move towards a more formal organization of an association. This has taken time, but at GASAT 6 a constitution and objectives were agreed, members paid their dues and a mechanism was put in place to elect the first GASAT Association Board.

So what is the future role and direction of GASAT? I hope that we will continue to operate as a network exploring common problems within differing contexts; that we will continue to provide mutual support for those with the temerity to challenge a world order still framed and operated to male priorities. This I see as a feminist task and men as well as women can be feminists.

We will survive only as long as members find an Association useful and have the resources to come together for conferences. International conferences are costly not only for organisers but also for participants and although we are grateful to the sponsors who have given generously to this conference, we are sadly disappointed that we were not able to bring to Eindhoven more of the women from East Europe who wished to attend. The other resource is people's time and commitment. We are indebted always, to the people who undertake to organise a GASAT conference and to the institution that supports them. We express a deep appreciation for the commitment of Marijka, Marja and Anita and their team and for the back-up given by Eindhoven University of Technology.

There will, no doubt, be a proliferation of groups concerned with specialist areas, such as WEPAN, which focuses on programmes encouraging and supporting women in engineering education. We hope they will retain contact with us. Some of you will know that I take an eclectic view, urging that we learn from each others' perspectives to generate a more holistic understanding of issues.

We have a recurrent problem - that of language. English has been the working language of all GASAT conferences and as one for whom English is the mother tongue I am humbled by the fluency shown by those of you who have different first languages. But it has been a major barrier to communication and participation from Southern Europe, including France; we are the poorer for it. A French feminist perspective of 'vive la difference' would make an interesting contribution to the debate on 'a science in which the question of gender drops away.'

Within the European Community language differences are met with simultaneous translations, but this requires expensive technology and skilled personnel. Perhaps one day we will become so valued in Europe that we are given access to these aids!

But we have a great opportunity next year at GASAT 7. Because of the special historical background to Eastern Canada many Canadians are bilingual in French and English. We hope that a number of French-speakers will come to Canada. If you know of any working in the GASAT field, persuade them to attend the conference. I am taking French conversation classes throughout this winter, especially to benefit from their presence!

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STRUCTURES - POLITICS - CULTURES
UNDERSTANDING THE GENDERING OF ORGANIZATIONS

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Abstract

This article presents a study of female graduate engineers entering male dominated organizations and management positions. The individual perspective used in most of the previous studies in the Women in Management tradition is criticized and a structural approach is developed. The main data come from case studies in six large Norwegian companies where pairs of comparable male and female graduate engineers were selected. The study shows how the difference in organizational structures is the main explanatory factor for the differences in opportunites for careers. A second stage of the argument juxtaposes these results with Kanter's (1989) and Clegg's (1990) studies of new organizational forms. The results of the study are used to develop a differentiated understanding of gender in organizations using feminist theories on how to conceptualize gender combined with diferent theoretical perspectives from organization studies.

Keywords:
women's opportunities
gender studies
organization theory
de-hierarchization

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STRUCTURES - POLITICS - CULTURES. UNDERSTANDING THE GENDERING OF ORGANIZATIONS.

Introduction

Organization studies as a field has been criticised for having neglected to include gender in its analyses, or, when gender is introduced, for an inadequate analysis of it (Mills 1983, Hearn & Parkin 1987). Gender in organization has until recently been treated only indirectly, either as part of Women in Management research (WIM) (Henning & Jardim 1978, Donell & Hall 1980, Marshall 1984) or as part of women and work research (Kaul & Lie 1982, Cockburn 1983, 1985, 1991, Knights & Wilmott 1986). At the same time it is fair to say that organization theory and organization research has not, until recently, been adressed in feminist research. Thus organization studies needs to confront the gender issue and gender studies needs to put organizations on its research agenda (Kvande & Rasmussen 1990). Organizations are, after all, the area where the sex-segregation of the labour market, the unequal distribution of rewards as well as gendered cultural images and identities are created (Acker 1990). We can now observe a move from studies focusing only on women in management to studies exploring gender in organizations. Studies are emerging where a more comprehensive understanding of gender and organization is being developed (Kvande & Rasmussen 1990, Calas & Smircich 1989, 1990, Acker 1990, Alvesson & Billing 1992). Our article is a *contribution to this development.*

Our point of departure is a research project on Norwegian male and female engineers and their career development in different work organizations. We wanted to examine opportunities for career development, graduate engineers being one of the main groups who are recruited into management positions in Norwegian industry. Between 1979 and 1985 the ratio of women at the Technical University of Norway had increased from 5% to 25-30% and has stayed there since. These changes mirror the general changes in women's relation to work and their participation in society in general in Norway where 75% of the women work and 60% of them work full-time.

We will develop our understanding of gender in organizations in a dialogue with this empirical material. In this dialogue we will use two strands of theorizing. One strand concerns the different ways of understanding and analyzing gender that have been developed in feminist research (Harding 1986, Calas & Smircich 1989). The other strand involves the different theories that have been developed in organization studies. By combining the two strands we will show how this "marriage" between feminist theories and organization theories enables us to develop a differentiated understanding of gender in organization.

From Women in Management to Women in Organizations.

The main field in research aimed at understanding women in organizations has been the Women in Management (WIM) literature which was mainly developed from the mid-seventies in the USA. A common trait of the WIM literature is the focus on individual characteristics of women, in the light of sex socialization and gender roles (Donell & Hall 1980, Powell 1989). Research on women in management, such as female graduate engineers, mainly uses a sex role model approach attaching importance to socialization. In such research much emphasis has been put on women's lack of self-confidence and ambition in order to answer the "why so few" question, which is the typical research question in this tradition (Terborg 1977a, Donell & Hall 1980).

We have structured the studies in this research tradition in the following four categories:

1) *The "trait" approach, where the main emphasis is whether women are "suited" to management.*
2) *The "motivation" approach, with the focus on women's "lack of" self-confidence or motivation.*
3) *The "strategy" approach, where the emphasis is on whether or not women are good enough strategists, making use of the right informal channels.*
4) *The "choice" approach, showing that women choose to give priority to their home and family rather than a career.*

The "trait" approach, is part of an Anglo-American tradition of research where certain characteristics of managers are seen as an important element of leadership theory (Yukl 1981). It is used as a basis for evaluating how far women "are suited" to leadership or whether they represent "deviant" values opposed to the traditional norms and values associated with management (Bartol 1978, Donell & Hall 1980). Terborg (1977b) says of the studies in the trait tradition: "In general women are perceived as being dependent, passive and subjective, and as lacking such attributes as competitiveness, ambition and leadership abilities".

The "motivation" approach is based on the idea that women uphold traditional women's jobs because they lack motivation and self-confidence; they score lower than men on these variables (Terborg 1977b, Hackett & Betz 1981). According to this view, women will try to avoid success because it can have negative consequences, such as loss of femininity and social recognition. They have a fear of success (Horner 1972). However, later research indicates that the so-called "motivation" reflects cultural stereotypes of male and female areas of achievement and of work (Nieva & Gutek 1981). Hackett & Betz (1981) maintain that it is natural to assume that women's work expectations will be lower than men's in a number of areas because women's chances have been and still are very poor in many areas.

In the "strategy" tradition Henning & Jardim (1978) with their book "The Managerial Women" are the main representatives. According to Henning and Jardim, men and women have different ideas of the concept of "career". Women define career in terms of personal growth and self-realization. Men are more likely to see career as *a series of jobs leading upwards providing status and recognition. Because of these different concepts, women are not aware of the informal network of connections which men have and use in their careers. This "hidden" system has a great deal of influence on the way work is organized, and until women learn to use it as men do they will be starting with a serious "handicap" in their way to the top, according to this view.*

The "choice" approach emphasizes women's "choice" or giving priority to home and family as the explanation of why there are so few women in non-traditional jobs and in management, and this is the predominant approach of the four. It is supported by studies showing that relatively few of the women who make a career in public or private business are married compared to the corresponding group of men (Hernes 1982). This is stressed particularly in surveys among American women in management positions (Henning & Jardim 1978, Business Week 1987). However, research from USA and the UK indicate that women in top positions now are integrating the role of mother with that of manager (Epstein 1983, Marshall 1984). A number of research reports have appeared pointing out that there may well be many advantages for married working women over the unmarried ones (Reskin 1978, Lukkonen-Groow & Stolte Heiskanen 1983, Marshall 84, Kvande & Rasmussen 1990).

A common denominator of the four categories presented is that they refer to characteristics of the individual rather than factors related to the work-conditions offered to men and women by the organizations where they work. The alternative *to this individual focus is to attach more importance to structural conditions in the work-organizations where women work than to individual.characteristics of women (Acker & Van Houten 1974, Kanter 1977, Epstein 1981, Kvande & Rasmussen 1989, 1990).*

An example of such an approach is given by Rosabeth Moss Kanter (1977). She shows how the structural conditions in a large corporation limit women's opportunities. Kanter's approach must be read as a criticism of individual-oriented explanations. Women's positions in the labour market are on the lower levels of the corporate hierarchy with limited opportunities for mobility. According to Kanter (1977) it is therefore unreasonable to conclude that women limit their career aspirations because of their sex-roles or family. She presents an alternative structural model which involves the structure of opportunity (meaning the challenges available, the chances of learning new skills and the earning of organizational rewards); the power (i.e. ability to get things done), and the social composition of groups (here meaning the relative number of women in work groups and departments).

The third structural variable, the social composition of groups, *is considered to be her most original contribution. Here she focuses on the importance of the relative number of representatives of different social groups in a workplace. The situation is very different if there is only one woman, some women, a minority group of reasonable size or a balanced group of men and women. If women are alone or only in a small minority, they will be seen by the majority as "tokens" or symbols of* *their group and not as individuals (Kanter 1977). Kanter has been criticised for the gender-neutrality implied in the relative number position (Fairhurst & Snavely 1983, Ott 1989, Kvande & Rasmussen 1990).*

Our main critique of Kanter, however, is that she studied only one company, with a traditional hierarchic structure. Therefore she does not take into account that different types of organizations may involve different structures of opportunity for the employees. Like most organization researchers she understands the bureaucratic and hierarchical structure of organizations as ***the*** *structure of "modern" organizations (Clegg 1990).*

Kanter represents a move from the traditional management research in organization studies as she focuses on organization members at many levels, and our structural perspective is inspired by this as well as by the Scandinavian sociotechnical work research in the work-democracy tradition (Emery & Thorsrud 1969, Herbst 1976). In this tradition we are especially interested in alternatives to hierarchies and in variations in organizational structures in order to test the hypothesis that organizations vary in opportunity structures.

Method

Our structural approach to male and female graduate engineers' careers and development led us to choose a qualitative method in our study. We needed information about the structural conditions of the organizations, the individual characteristics of the engineers and the processes of gender differentiation within the organizations. With these needs in mind three different data-sets were employed.

First case studies were carried out of six large Norwegian companies that employed many graduate engineers, and more than ten female graduate engineers. By varying ownership (public and private), branches (chemical industry, electronics, oil, construction, research and development), new and old businesses, employing different types of graduate engineers and having affirmative action for women or not, we wanted to cover differences in structural conditions. These variations would also make an analytic or substantial generalization possible (Yin 1984).

Within each of the firms we carried out in-depth interviews with pairs of graduate engineers: one male and one female engineer who graduated the same year and were employed within the same department. Through our selection of pairs from the different firms we could compare men and women across the firms and within the firms. We made in-depth interviews with 26 pairs of graduate engineers in the six companies. We also interviewed the managers of the pairs and key informants *about market, organization and personnel policy.*

Secondly, we carried out a postal survey of all female members of the Norwegian Engineering Society, asking questions about their work and work experience, career and career plans, management, family and housework.

The third and final data set comprised a national survey with structured questions of all groups of female academics concentrating on the themes of work and family. From this data set we selected the responses from women educated at the Technical University.

Our study is reported in a book that discusses all our findings around work, careers, family and individual strategies and differences among women and men. In this article we will draw mainly upon the six case studies. We will, however, in also use some of our findings from the two surveys.

Different organizations - different opportunities.

The inadequacy of an individual explanation for women's lack of participation in management, was confirmed in our study. Our surveys showed that the female graduate engineers were motivated for careers without sacrifying a family. When asked wheteher or not they would take a management position when offered, 70% of them said that they would. The highest motivation we found among the mothers of one child (82%), and the lowest among the mothers of three or more children (63%). We also found that the female graduate engineers were more often married and had more children than Norwegian women in general. The female graduate engineers wanted to combine family and career (Kvande & Rasmussen 1990, chapter 5).

Studying different types of organizations turned out to be very important in our study of female graduate engineers. We had expected to find that the women had the same, equally unfavourable, opportunities in all the firms. However, we found that there were greater variations between the employees in different firms than between the male and the female graduate engineers in our sample as a whole.

We found that the six companies could be divided into two main groups. Two of the companies showed no systematic differences in opportunities for career and development between male and female graduate engineers. The other four showed a traditional pattern of gendered differences in opportunities: the male engineers had systematically better opportunities than their comparable female colleagues.

There are some striking differences in organizational structure between the "equal opportunity" companies and the others. We have isolated characteristics of the two different types of organization in order to study them as ideal types. These ideal types serve as a reference point against which the individual companies can be measured. The companies where we find that men have systematically better opportunities than women, are characterized by a hierarchical organization structure and they operate within stable markets. The companies where opportunities do not vary systematically according to gender are characterized by a less hierarchical and more flexible network-type of organization and they operate within turbulent and changing markets. We labelled the two types static hierarchies and dynamic networks. The dynamic networks we found in the telecommunications and electronics industry and in engineering (construction of oil installations). The static hierarchies we found in an oil company, the chemical industry, research and development and public telecommunications.

By looking at variations in organizational structure we take a step further than former studies of women and organizations where the hierarchical bureaucratic organization has been treated as the dominant modern organization (Kanter 1977, Ferguson 1984, Ressner 1986). Thereby the researchers have been able to maintain the view that organization structures are gender-neutral and that the gendering occurs through a separate structure or process, like patriarchy, as Acker notes (Acker 1989). Our results show how different organization structures are gendered differently.

Our results do not confirm the common belief in the social democratic Scandinavian cultures, that public organizations further women's careers whereas private organizations do not. This belief is built mainly upon a weberian logic that within public bureaucracies the impersonal rules and regulations will hinder discrimination and arbitrary treatment of women. In private organizations the subjective views of (male) managers are supposed to exclude women from *important jobs and positions. This belief in the objective functioning of rules and regulations in organizations has been a cornerstone of the equal opportunity policy in the Scandinavian societies (Hernes 1982). Our results seriously challenge this belief.*

We shall explain the differences in opportunities for men and women in the two types of organizations by discussing some of their characteristics. Dynamic networks are open to innovation and change whereas static hierarchies are status quo-organizations. The dynamic networks make women visible as professionals and provide leadership training whereas the static hierarchies make women invisible as professionals and promote homosocial reproduction in management. These characteristics are discussed in turn below.

Dynamic Networks.

We found that the organizations with no systematic differences in opportunities between male and female graduate engineers were the ones where the market was turbulent and required an organization structure which was very flexible and open towards new approaches. These companies have had to be dynamic; they have profited from trying out new ideas and non-traditional approaches. This in turn has created a corporate culture which welcomes change and new ways of doing things, including trying out women in non-traditional positions. They have a fundamental openness towards change. The hard competition forces them to use all their resources. One of the women in a dynamic network organization said:

> "I'm surprised at the opportunities we have here. There is room for new ways of thinking in the organization. It doesn't have a fixed structure but has to keep alert and be innovative all the time. It has to follow the signs of the times. I think this is what makes it more open to taking on women and giving us opportunities."

The power structure in network organizations strengthens the dynamic aspect. The decentralized structure is based on the idea that everyone who has relevant knowledge for the problem in question is involved in decision-making. Different ways of thinking, values and opinions represent a resource for interpreting signals from the market and the environment and in working out solutions to new challenges. Women and their points of view are seen as a resource for the organization.

In dynamic networks the work is organized in teams where all members are equally important and all contribute knowledge and effort on an equal basis. As they work, the graduate engineers get to know each other's academic and personal qualifications. The women become visible as professionals for their colleagues and superiors.

The organization of tasks is flexible in the dynamic networks. The employees here do not have clearly defined tasks and areas of responsibility, but their tasks and *responsibility alter progressively as the situation changes. The employees are given responsibility and challenges whether they want them or not. One of the women said:*

> *"What I don't like is never having time enough to follow up all the challenges in the job, at least not in a normal working day".*

A female manager told us how she solved the pressure between having a family and a demanding job:

> *"I am known as one who use flexitime in the extreme. I have done it the way I want, and it has been accepted. Maximum flexitime is an important condition in my life. The kids decide the tempo in the morning. When I get to my job, I work hard. I like it that way."*

In dynamic networks the engineers get a gradual training for leadership through their work, and this seems to suit women well. It also makes it easier for women to volunteer for new tasks. Managerial careers in dynamic networks tend to follow "natural" routes where the position is a direct result of the tasks and responsibility one has had beforehand (see also Kanter 1984, 1989).

The function of the manager in the dynamic network is to be a coordinator of a team. When decisions are made in close consultation with all those involved and all available experts on the topic, it is important for managers to be able to delegate, to cooperate with their colleagues and to inspire them. These are the very qualities that women feel are particularly important in a managerial position, and this is where they think that they as women, have something to offer as managers.

These findings correspond to the studies on organizations and innovations where both Burns & Stalker (1961) and Kanter (1984) find similar differences between the stable and the changing and innovative organizations and situate us within the contingency school of organization theory (Burns & Stalker 1961, Lawrence & Lorsch 1967, Pfeffer & Salancik 1978). However, gender has not previously been drawn into analysis of the structure of organizations and their environment. We find that the gendering of organizations is influenced by the characteristics of their environment and by the structures that they develop to suit this context.

Static Hierarchies.

The other group of companies we have labelled static as opposed to the dynamic organizations. This is because they operate in very stable markets with few if any requirements to change. The centralized pyramid structure of the static hierarchy ensures a continual reproduction of the culture, which makes such organizations very stable. The organization will try to maintain the status quo in order to avoid disturbances. Therefore it is not open to change or ready to accept anything new or different. A frustrated man said:

> *"The responsibility for change lies with the managers, and they do not always welcome inititatives from below. We send proposals for new methods or new products the formal right way, but no get response. We, who receive the signals, are not allowed to follow them up, and the ones who are responsible for the follow-up, are not in the position to understand the signals."*

In organizations dominated by men, women represent something new and different and will therefore tend to be met with rejection or scepticism. Women are, or are assumed to be, different from men and therefore they have problems being considered relevant and central to the organization. Women are allowed to do traditional women's work in women's jobs, such as office or secretarial work where they are subordinated to men in a "natural" way in these organizations. If, on the other hand, women impinge on areas dominated by men, such as technical work and managerial positions, they challenge the existing gender arrangement and hence the stability of the organization. A newly appointed female manager of a department told us:

> "I did not get this position without a struggle. There were some old men in the department, and they had their crownprinces. Because I knew that, I contacted the union representative when the job was announced. I applied, and I went to the National Board of Equal Opportunity when I was surpassed. The old men were very angry when they had to give me the job after all."

In the static hierarchies we find all the well-known mechanisms described by Kanter and others (Kanter 1977). Women become invisible as professionals and get stuck in blind alleys. A young women in a static hierarchy told us:

> "I never get any feed-back on my performance. When I prepare a paper, my boss never tells me that it is OK, or suggests any changes. The only thing he ever said when I asked him once, was that my handwriting was very nice. I manage in this job because I can bring work home with me and discuss it with my husband."

A career in a hierarchy involves promotion to a higher position. To get new challenges, new tasks and increased responsibility in a hierarchical organization, you apply for another job, either in a different department or upwards in your own department. A woman's chances of getting a better job are poor because they depend on whether she has been visible as a capable and important member of the organization. In order to become visible she must have had challenges, met them successfully and shown her superiors that she was professionally outstanding. In hierarchical organizations a woman is professionally invisible and this puts her in the back of the row for more important jobs.

Other research has shown that managers choose managers who are similar to themselves, i.e. with the same educational background, the same social background and the same sex and race (Mills 1963, Kanter 1977). Managers recruit new managers who will fill their posts in the way that they themselves want them to be filled so that the system will continue to function well. Anyone who is similar to the manager is assumed to think the same way as he does and to make similar decisions. Women are different from men and in some ways behave differently. Men who are similar to their managers and follow the same norms and values can make themselves noticed as supporters of the managers and be visible. This gives them the best chance of promotion. This homosocial reproduction at managerial level reinforces the reproduction of status quo and thereby male domination.

We had chosen firms with and without programs for affirmative action for women. One might expect that the firms with affirmative action would be the ones with good opportunities for women. This was not the case, however. The dynamic networks did not have affirmative action programmes. Some of the static hierarchies did. The affirmative action we found was typically not directed at the organization structure but at the motivation of individual women. This strengthens our point about the importance of focusing on organizational structure and not on the traits or motivation of individual women if you want to understand women's careers.

Women's opportunities in changing organizations.

According to our findings de-hierarchization becomes an important measure to increase womens opportunities. Recent studies of organizational change and structure of organizations (Piore & Sabel 1984, Handy 1984, Kern & Schumann 1984, Kanter 1989, Clegg 1990) focus upon a trend towards such de-hierarchization or de-differentiation as we have found in the dynamic networks.

Rosabeth Moss Kanter's more recent work on big corporations in North-America and Europe (Kanter 1989) suggests that these companies are moving away from diversification towards maximizing their core business competence. They develop by delayering the hierarchy and making the company leaner. The borders between the company and its surroundings also change through strategic alliances with other firms, subcontractors and spin-offs from the old mother-firm. They try to *strengthen their relations to the customers and to their business partners through alliances. Kanter call these firms post-bureaucratic or post-entrepreneurial because they try to combine the strength and stability of a big corporation with the agility and innovative capacity of the entrepreneur. The reasons for these changes are the changes in market conditions and increased competition.*

Stewart R. Clegg (1990) uses studies of new organizational forms especially in Asian industrialized countries, but also in French, Italian and Swedish industry, to advocate the decline of modernist organizational principles based on a differentiation of tasks, familiar in Tayloristic and bureaucratic organizations. Clegg sees many examples of organizations that are highly competitive but are not conforming to these principles. He sees tendencies to de-differentiation and de-hierarchization which he labels as the emerging postmodern organizations (Clegg 1990).

If these tendencies are dominant, we could expect that women's opportunities are changing for the better. However, when we find that the dynamic organizations give women good opportunities for career and development, and equal opportunities with their male colleagues, that doesn't mean that they are de-gendered or gender-neutral. Dynamic networks will make use of women to further their ends, and they will use the women to the point of exploitation if they are allowed. They are based on the male principle of work orientation: "The job should be the foremost in your life, and the family should accomodate to job demands." They may be flexible and you may do the job wherever or whenever you want, as long as it is ready on time.

The female graduate engineers use this flexibilty to juggle their job and family responsibilities in cooperation with their spouses. Only as long as women are willing to confirm to this traditional male work-ethic are they given opportunities.

It is also a fact that gender -and sex- still plays a role for the women in the organization, even if they may have career opportunities or management positions. They may encounter sexual harassment in meeting with customers or other managers. Male colleagues at the same level, or at lower level, are still likely to have problems with women in authority. A female manager in a dynamic organization reported on how she felt she had to downplay her managerial authority towards a colleague who had been her competitor for her position. She felt responsible for his dignity and felt that she had to treat him as an equal even though she was now his boss. Thus "equal opportunity" organizations will still be gendered (Acker 1990). This brings us over to an explicit discussion on how to understand gender.

Gender and organization - reconceptualization.

Traditionally gender has been treated more or less as a dichotomous variable: as difference between the category men and the category women. This concept of gender as "difference" and a dichotomous variable has been challenged by feminist researchers. Black feminists and feminists from the third world challenged the concept of a woman's perspective that was supposed to include the interests of all *women (Spellman 1988, Aphteker 1989, Collins 1990). Changes in women's lives also made it problematic to use a general concept of woman. Women became diversified through their entrance into the world of work at different places, times and social levels. This has made a differentiation in the understanding of women necessary. Male and female and masculinities and femininities were introduced instead of the clear dichotomous concepts man and woman. The focus moved from the differences between men and women to the meaning of gender in different situations and contexts. Gender becomes a perspective from which society is understood as gender-constructed. This opens for analysing the gendering of seemingly gender-neutral phenomena.*

In the course of the 80's the concept of gender or the gender system was developed (Harding 1986, Hirdman 1988). The gender system is used to refer to structural, relational and symbolic differentiation between men and women. Rather than asking how female oppression is produced and maintained as in the theories on patriarchy (Hartmann 1979), the question is how gender is an integrated part of processes and structures which have hitherto been considered gender neutral.

Theories on gender system make it possible to visualize male dominance and female suppression as being made up of a great many and different components and processes. Hirdman (1988) characterizes the gender system by two logics: dichotomy, dividing society into male and female areas, and hierarchy, with the male as the normal and universally valid form and the female as deviant, ranked below and subordinated. She understands the segregation of male and female as *something that is happening continuously through processes that create meaning and dominance. Human beings become men and women through cultural transmission, integration into social institutions and socialization.*

Acker (1990) proposes a similar gender perspective for studies of organizations. She understands organizations as basically characterized by gender and the gender arrangement, i.e. the male domination, of the society. Gendering is not an addition to other structures or processes that are gender neutral. It is a part of these processes and they cannot be understood without analyzing gender.

Gendering in organizations occurs in at least five interacting processes (Acker 1990). These processes are:

1) Construction of divisions along lines of gender: division of labour, allowed behaviours, power and the means of maintaining the divisions in the structures of the labour market, the family and the state.

2) Construction of symbols that explain, express, reinforce or oppose those divisions. These can take many forms: in language, ideology or dress.

3) Patterns of interaction between men and women, women and women, men and men, including all those patterns that enact dominance and submission.

4) Gendered components of individual identity, which may include consciousness of the existence of the other three aspects of gender.

5) Gender is implicated in the fundamental ongoing processes of creating and conceptualizing social structures. Gender is a constitutive element in organizational logic as well as in the construction of class.

This gender perspective opens up for the possibility that differences between men and women may not necessarily be hierarchic, that is dominated by men. According to us, this perspective makes it possible to see ruptures in the general oppression or subordination of women. It indicates a possibility that even within a general male dominated society, we may find situations without female subordination, i.e. gender differences without hierarchy. Within this perspective we can understand our findings of some organizations offering women the same opportunities for careers as men.

In the following we will show how gender in organizations can be understood as an integrated part of political and cultural processes in organizations. This indicates a move from a predominantly structural perspective to a perspective where we combine the structural with political and cultural traditions.

Organizations as gender-political systems.

Thus far in the analysis of the empirical findings of this paper, we have had to differentiate between organizations to understand the conditions under which women are given good opportunties. If we had stopped with this structural perspective, we would have treated organizational structures as gender neutral and gender as a dichotomous variable. We will now analyze the organizations as political systems, as the arena for power, conflicts and interests (Morgan 1987), and we take this one step further by introducing the term gender-political system.

Burns (1961) shows that modern organizations promote forms of political behaviour because they are systems simultaneously involving cooperation and competition. These conflicting dimensions are clearly symbolized in the hierarchical map of organizations which is both a system for cooperation, a rational sharing of the tasks, and a career ladder to motivate individuals to upward mobility. As there are fewer positions the higher one gets in the hierarchy there is progressively more competition. In our study we found that one of the great differences between the two types of organizations was the multiple challenges in the dynamic networks compared to the very limited career openings in the static hierarchies.

In the hierarchical organizations women have to compete with men for limited organizational rewards such as promotion and opportunities to influence decisions (Harlan and Weiss 1980). This competition makes the conflicting interests, the unequal power and the possible conflicts between men and women within the organization visible. In a gender perspective it becomes clear that the conflicts, power and interests within an organization also include what men and women are allowed to do, how they are allowed to behave and how men and women are to be ranked and valued. This is one of the main gednering processes in the construction of the gender political system in organizations. We found that especially within the static hierachies the competition between men and women for opportunities was a problem for the female graduate engineers. Their male competitors made gender an issue to exclude women. In an occupation that has traditonally been totally male dominant and in an organizational structure where women are made invisible as professionals this was not very difficult.

We have in our analysis of the two types of organizations put much emphasize on a structural explanation pointing to the differences in structures between hierarchies and networks in our analysis of the two types of organizations as gender political systems. By labelling them static hierarchies and dynamic networks, however, we have also pointed to the close connection between the organization's culture and its structure. The general climate in dynamic networks is positive towards women because of the opennes towards new ideas and approaches, while in the static hierarchies women are seen as "foreigners" or intruders because they are different and may threaten the status quo. Gender is an integral element in both the structure and the culture of the organizations, and we will therefore advocate an approach that does not separate structure and culture, but see them as two interlinked aspects.

In our analysis of the two different types of organizations we found that they were gendered in very different ways; they produce different gendering processes. By introducing gendering processes in organizations, we also introduce the actors within the organizational structures. We can understand static hierarchies and dynamic networks as organizations with different gendering processes. The two types of organizations with their different organization structures become arenas for different types of organizational actors, or stages where different types of organizational actors can play the leading part. The two types of organizational structures make room for different types of men and women, different masculinities and different femininities, "placing" some men and some women in the foreground and others in the background.

We will develop our analysis of the two different types of organization further by using more of the data from the case-studies and some of the data from the surveys. We will especially present data on the differences between the women and the differences between the men to understand which types of men and women, or masculinities and feminities, will have opportunties in the two types of organizations.

According to this way of analyzing the organizations, the static hierarchy can be seen as a stable patriarchal organization in the traditional sense of the word, where the older men rule over the younger ones. The rules of the game are old and well-known, and the younger men are disciplined by the competition for careers and possibilities that the elder can bestow upon them. Women are in principle non-persons in these organizations. It is primarily a question of fathers and sons or kings and crownprinces, not of daughters or princesses.

Dynamic networks are organizations in change without the same stable power structure. This gives the younger (and dynamic) men - and in our case also crucially the young dynamic women in the organization - opportunities for development, career, influence and power. Dynamic networks suit the young professionals who want to expose themselves now and not in the far future. They don't want to be the subordinates of the older men, controlled by them.

In these days, it is "in" to make room for women in the organizations at least in Scandinavia and in the US, and a totally male dominated organization is no longer legitimate in Norway. "Modern" organizations therefore can be seen to promote women's opportunties, at least in words. Dynamic organizations are examples of modern and innovative organizations. They give room for women, at least for those women who participate according to the same principles as the young and dynamic men. Many of the female graduate engineers do: they want a career as well as a family, and they want to show what they can do.

The dynamic network may therefore well be the organization for the dynamic men and the "new" women whereas the static hierarchy is the organization for the old men and their subordinate and loyal crownprinces. Female graduate engineers as a group are typical representatives for the "new" women: women who choose professions and careers like men do and who do not accept a traditional female role in a subordinated position at work. We have seen that the female graduate engineers had better opportunities in dynamic networks than in static hierarchies. If we look more closely at the women in our study who have made a career and reached management positions at middle level, they are mainly from a category of women that we in our book have named "the challengers" (Kvande & Rasmussen 1990, chapter 11). They are women who have chosen both a career and a family and who create a managerial role in their own way, different from most of their male colleagues. They are female managers. The more detailed analysis in our book also suggests that the challengers are typically their father's daughters: they are daughters of graduate engineers, most of them managers. They have fathers who have motivated them and supported them in choosing an untraditional education and profession like engineering. Therefore they come equipped with both the technical interest and also the class-background that give them confidence and strength when they go into the male dominated profession.

To refer to opportunities for female graduate engineers in the dynamic organizations is not necessarily to say anything about the opportunities for other women in the same type of organization. It may say something about the opportunities for the women who are "more like men" in their attitude to work, that is who want to participate in working life like men and who do not accept a subordinate position or show traditional female attitudes. The situation may well be different for other women and for women at lower levels of the organization.

If we combine a political and a cultural perspective, organizations can be understood as arenas where multiple cultures and countercultures compete to define the nature of situations. The corporate culture can then be understood as a result of political processes where different groups with different interests compete (Frost 1987, Meek 1988, Knights & Wilmott 1991, Knights & Morgan 1990). Gender identity, like different masculinities and femininities, is an important element in these processes.

Morgan & Knights (1990) use this perspective in their analysis of how jobs become gendered. Using a case from the banking and insurance sector, they describe how the agressive male sales culture met with resistance from the male bank hierarchy. The bankers represented a masculinity that was very different from the masculinity of the sales representatives. The bankers were paternalistic, steady, responsible *and cautious whereas the sales reps were aggressive, high-performing, had to have "nerve" and "a bit of cheek" to persuade the public to buy their product. The bankers allied with the female staff at the counter to get rid of the sales reps from the insurance company in the bank so that the female clerks could take over the selling of life insurances. Morgan & Knights show how these discussions about the gender of jobs took place as a discussion about the bank's strategy (Morgan & Knights 1990).*

We will suggest that when the female graduate engineers have good opportunities in dynamic organizations, it is because they match the dominant male group (the young "dynamic" men) in the company in their views on work and organization and in their opposition to the traditional male hierarchical rule. They "find" each other in their interests in getting something done in different ways, by alternative means. In Morgan & Knights' case we also see alliances between a dominant male group and a group of women against another and threatening male group leading to new opportunities for women. It may seem that the alliances between groups of men and groups of women is crucial if you want to understand the opportunties for women at work, and in these alliances the gendered work identities play an important role.

Conclusion.

We started out by underlining the necessity for organization studies to confront the gender issue and for feminist research to acquire a better understanding of organizations. We also advocated a more differentiated approach to the issue of gender and organization where both women and men as well as organizations were seen as heterogeneous. In the first part of this article we have illustrated the importance of a differentiated view of organizations by choosing a research design which secured variation in organizational structures.

The focus on variations in organizational structure was selected as an alternative approach both to the dominant Women in Management literature where the focus has mainly been on women's individual traits, as well as an alternative to Rosabeth Moss Kanter's structural approach which included only one type of organization (Kanter 1977). This perspective turned out to be of great importance when studying female graduate engineers and their opportunities for development and careers. We found that the opportunities for career and development for women vary according to organizational structure of the firm. In the static organizations with hierarchical structure the women have poor opportunities whereas in the dynamic organizations with team-work and network structure they have good opportunities. These findings were discussed in light of new organization studies showing a development of de-hierarchization towards leaner and more flexible organizations (Kanter 1989, Clegg 1990).

As a second stage we have combined our empirical results with two strands of theorizing. We used elements from feminist theory on the understanding of gender and combined this with political systems theory and a cultural understanding of organizations. This enabled us to illustrate how to avoid analyzing organizational structures as gender-neutral like Kanter (1977) does, showing how gender is an integrated part of political and cultural processes in organizations. The differentiation in the category women and the category men enabled us to analyze the organizations as the arena for different gendered identities, different masculinities and different femininities.

We analyze the static organization as patriarchal: the old men's organization for control over the younger men, an organization where women have no natural place in the hierarchy of men. Dynamic organizations can be seen as the younger and coming men's organization: a place where they can "make it" without being held down by the hierarchy of the older men. It is also an organization, we cane note, where they can form alliances with the "new" women, the ones that are "like themselves" in work-orientation and motivation. They can form such alliances against, or free of, the old patriarchal and paternalistic regime in the static hierarchy.

We have thus, through a differentiation first in organizations and after that in the categories women and men and masculinity and femininity, developed a more differentiated understanding of gender in organizations.

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SUMMARY OF ACTIVITIES

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EAST-WEST FORUM

Chair

Dora Dolle-Willemsen	The Netherlands

Members

Valentina Zlenko	Ukraine
Hanna Ziajka	Poland
Vitalina Koval	Russia
Adela Rogojinaru	Romania
Seçkin Ergin	Turkey
Olga Plávková	Czech and Slovak Federal Republic
Mihaela Singer	Romania
Tatiana Koke	Latvia
Petya Kabakchieva	Bulgaria

After a short introduction Dora Dolle raised some issues to be compared between East and West: about equal treatment, relations between men and women, sex-differences and their origins, role expectations: choices men and women make, subject choices and the hidden curriculum.

Question to the forum members: What, in your system, works for women and what not?

Every participant was asked to introduce herself and discuss her topic:

Valentina Zlenko talked about **women's participation in the decision making process**. The low status of women in society could explain their underrepresentaion in the decision making process. Women's low status is worse than before. In the Ukraine less than 3% of the deputies in parliament are women, but there is hope for the future: there is an increase in political activity of young women in the student movement.

Hanna Ziajka's topic was **the situation of women in the cities and the countryside**. Theoretically there are equal opportunities but in practice most women work long days and have no free time. In younger families the sex-roles seem to be less restricted. Rural women have less opportunities than women in cities, because of cultural norms which means low status for women, very long work hours -on average 15 hrs/day- and scarce services (educational, medical) and shops. The catholic church is influential, also in the rapid social, political and economical changes in Poland today.

Vitalina Koval discussed **gains and losses after the transition**. Before the perestrojka there was official equality of men and women, but women could not critically discuss their situation. Now there are only 5% women amongst members of parliament, instead of 33% before perestrojka, but they are free to really express the interests of women. The economical situation is extremely difficult: 80% of families lives below the poverty line. Prices increased 1000 times, but salaries only 4-5 times.

Adela Rogojinaru told about **women in science and technology: male and female careers**. In the old regime there was "centralized feminism", with the wife of former president Ceaucescu as the "symbol of feminism". There are a lot of female engineers in Romania because of examination opportunities, but many would prefer more theoretical mathematics and physics studies. Getting in higher positions depends on professional competence, especially in new technologies (computers). It might be a dangerous development there are no women in new commercial activities, except fashion and light industry.

Seçkin Ergin's topic was **the position of women before and after the republic in Turkey**. Before the first world war Turkish society was patriarchal, the women were confined to the home, they had no constitutional equality, social security and they were discriminated in the family. After the revolution women got the vote (in the 30's), and they rose to higher positions but later on they were set aside. So the question now is: Do we make good use of our rights?

Olga Plávková discussed **the situation of women in the labour market**. After the revolution in 1989 there were changes in women's employment. Women are interested in higher positions, not only for economic reasons, but also because they want to use their education. But the majority of women is passively waiting for developments to take place while men take over the jobs and restrict women to the household.

Mihaela Singer talked about **changes in the curriculum in the face of economical and political changes**. The transformation to democracy and a market economy means that education has to be changed, in its presentational methods and in its contents. New subjects include technology and marketing. Teachers have to be trained for these subjects and gender-issues need to be integrated.

Tatiana Koke discussed **women's careers in science**. In the Latvian economy 55% of the women are employed and 58% of the teachers are women. Amongst scientific researchers 47% is female. A large proportion (52%) of students is female, also in the natural sciences, but there is a high drop-out rate amongst women, not amongst men. There are very few women in the highest academic positions. It seems women can now afford themselves the "luxury" of not having to work and be a housewife and mother instead.

Petya Kabakchieva talked about **the influence of the traditional model of equality upon the status of women in science and technology**. Bulgaria is an agrarian society in which the women do a lot of the work inside and outside the home. In 1990 there were 30-50% women in science. The father is the dominant figure in the family and women have lower status than men. The gender problem is not only related to economic issues, it is also a question of power. But in the socialist culture there was no vision of women's cultural emancipation.

Discussion

Influence of parents

In Western society the most important influence on young women's choices appear to be the parents. This is/was not so in socialist or communist societies because of the de-emphasizing of the family and the emphasis on the 'brotherhood of men' and the production group. Children are brought up in childcare facilities, not in the family. The peer group has much influence.

Role of the father

The role of the father is rapidly changing and can become problematic when women demand the men take their share in household and childcare duties. The role of the father used to be very patriarchal, depending also on age, urban situation, religion etc. The father can be important as the counsellor to the daughter in a technological career.

New women's organisations

In many Eastern European countries new women's organisations develop. Or old women's organisations change towards new orientations. But it is sometimes difficult to find new ways of organisation and co-operation when democracy is still new.

Annita Alting

HOMEGROUPS

In the tradition of other GASAT conferences we formed homegroups. Homegroups are small groups which meet daily during the conference and are meant to reflect upon, discuss and synthesize understandings gained during the conference. They are pre-arranged groups, each with a non-native speaker as facilitator. The composition of the homegroups was as mixed as possible.

Homegroup meetings took place during the tea.

A short training session for homegroup facilitators was organized on Sunday afternoon.

We received the following report from Hannie Rodenburg-Smit who led the training session:

Of the nine facilitators seven were in the training session.

Warming-up

We started with an introduction and warming up by telling what our first ideas this morning were.

Earlier experiences with groups

To realize what it means to be a facilitator, we discussed earlier experiences with groups. Therefore participants answered at the following questions: Which experiences do you have in facilitating groups? And of what kind of groups have you been a leader?

(Think of small groups varying from scouting groups to students at university level or in your worksituation.)

Next participants gave examples of a good and of a bad facilitating experience. They talked it over with each other. Some of them already had earlier experiences in GASAT-homegroups.

Expected problems in facilitating

All participants were asked to imagine bad and unpleasant situations in their homegroups next-week.

They were asked to describe on a piece of paper what would be the worst and most unpleasant situation (emotional, social, intellectual or cultural

problem situations).
It gave a spectrum of problems, like: "Someone who never stops talking", "One of the people doesn't agree with the program and want to change the music evening for a discussion. She found 45 people who agree with her".

Suggestions for "solutions" of the problems or improvement of the situation

All participants wrote down ideas, experiences or suggestions which could help to solve the problem of their colleague. Examples to the problem of the person who never stops talking: " give all members 2-5 minutes time to speak", "make it a common problem, the talkative one should be prepared to be corrected by a sign, a joke or otherwise".
We read all the problems and the possible solutions/suggestions and each participant replied which of the suggestions of her colleagues fitted her.

Short evaluation

At the end of the session the participants were asked to give a short impression of the session. One of them would have liked more structure. But the main idea to introduce the task of the facilitator, appeared to be conveyed in a good and pleasant way: you learned to know the other facilitators and learned from them; you began to realize what the task looks like and became more familiar with it.

At the final homegroup meeting on Thursday, participants completed a conference evaluation activity and presented it during the last plenary session.
The following evaluation questions had to be completed:
I liked ...
I thought ...
I learned ...
I would have liked ...

Summary of the evaluation in the homegroups

I liked

Atmosphere

(often mentioned as: pleasant, co-operative, friendly, cohesive, positive, informal and caring)

Meeting people

(mentioned were: Eastern Europe, old friends, new friends, own country, diverse nationalities)

Design of the conference

(variety of format, discussions in a variety of small groups, active/passive, papers/workshops),

Sharing ideas/strategies

(variety of experiences, ideas and opinions, comparing experience with others, similar thinking)

I thought

Some of the workshops were too divers; the conference to be more theoretical/to be more practical; paperpresentations were well; the GASAT conference is a real stimulation for the motivation you need to do your job.

I learned

Differences between countries in (Eastern) Europe; different countries/ different cultures; complexity of gender and science issues; political, economic and gender situation in Eastern Europe and Turkey; researchers in Eastern Europe have many problems/gender is low; about other peoples experiences and training courses.

I would have liked

More time

(for: homegroups, meeting Eastern European women, to reflect, to ask questions, free time!)

Papers earlier

More travel information; less luxureous hotel; other organization of dinner (faster, vegatarians not separated)

Swimming pool fixed.

Papersession I.1

SCIENCE AND TECHNOLOGY EDUCATION IN EAST AND WEST EUROPE

Marja Brand
Ten years Ment-project girls into physics and technology education
Alan Durndell
Gender, science, technology and engineering: education in Britain and Bulgaria
Hana Nováková
The philosophy of technology education in our democratic school
Carrie Paechter
Gendered subjects coming together: power and gender in the design and technology curriculum for England and Wales

No report received.

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Papersession I.2

CHANGING TEACHER BEHAVIOURS AND COLLABORATION IN CLASSROOMS

T.E. Dolle-Willemsen, J.C. Rodenburg-Smit, L.C. Engelfriet, M.J.M. Verbruggen
Changing teachers' attitudes to gender issues in education. Systematical classroom observation an instrument!
Magda Man in 't Veld
A teacher training course on gender inclusive strategies for teaching science & technology
Helene Sørensen
Is it possible to change science-teachers' way of teaching?
Elizabeth Whitelegg, Patricia Murphy, Eileen Scanlon, Barbara Hodgson
Investigating collaboration in primary science classrooms: a gender perspective

Dora Dolle explains that their paper deals with the results of an action research project on classroom interaction and teacher training. They organize courses for graduate students, postgraduate students and teachers on classroom management by using self-evaluation, computer technology and role play and focussing on values of question techniques. Videotaped lessons are observed and evaluated. One of their findings is that it is very important to start at the level of the participants.

Magda Man in't Veld says that her paper is a report of the implementation of a new course in the training program for technology teachers. The participants of the course are adults, some of them experienced teachers. The Australian GAMAST project served as a model. Objectives of the course are gender inclusive teaching strategies. Including women and girls in the curriculum of technology education means including male as well as female values and qualities. This implies a new image of technology: inventing, using and evaluating technology. Furthermore this implies teaching strategies which involve all students in the learning process, and non-competitive assessment.

Helene Sørensen has been working with science teachers in the Danish primary school system, who did a lot of practical work. She found the teachers were in control of the class and the learning process. Her further aim was that pupils get ownership of their own learning process. She was a

participant observer and worked as a consultant of teachers. She used meta-cognitive strategies but it turned out te be difficult to change the teachers' behaviours. You come too close to the individual teacher's personality.
Liz Whitelegg says her group looks in the first place at working in small groups in primary education, while Christine How is looking at its gender aspects. How can the tasks of small groups be formulated in order to stimulate co-operative learning. More structured tasks are needed to make it possible to guide the teachers' behaviours. Open ended questions have the effect that girls will find out what the teacher wants.
Hannie Rodenburg summarizes that changing teacher behaviours is difficult. She asked the participants of the paper presentation to formulate their questions in small groups of four persons. This turned out to be a good strategy to involve everyone in the following discussion.

Papersession I.3

STUDENTS, LECTURERS AND TEACHING METHODS IN MALE DOMINATED UNIVERSITY CONTEXTS

Seçkin Ergin
The use of bilateral relationships to promote curriculum development for girls' vocational schools in Turkish speaking Eastern European countries
Petya Kabakchieva
Women university lecturers in the eyes of their students. Hypotheses and socio-cultural prerequisites in Bulgarian experience
Anette Kolmos
Metacognitive aspects in a group-based project work at technical universities
Marjan van der Wel, Marjon Menten
Being a student at Delft University

Summary

The discussion considered interaction between male and female students and female lecturers within different educational structures and methods. It was concluded that there are problems but these cannot be solved through applying different methods to an unchanged system (e.g. project work). It is a broader problem related to attitudes of students and teachers.

Discussion

We identified a common problem: the communication between male and female students. It was suggested to use group processes to break down barriers through interactive project work.

We discussed the basic problem in Turkey: religion. Girls went to single sex schools which was better than no education, and it gave them a chance to go to university. These girls then become non-traditional Muslim girls. In Turkey and Bulgaria this method produces the social mould of the country and also the cultural basis of the country. But, the girls face difficulties in the labour market and a lack of power. In The Netherlands female students feel the same (as males) but they are treated differently. In Latvia interaction in education does not lead to interaction in the labour market.

In Poland and Finland and the United Kingdom it seems like male and female students are treated the same but they don't go into science and technology.

Reasons for this:

Education reproduces traditional male and female roles. Technical Universities are suited to boys (masculine). Single-sex schools lead to poor social development of girls. Professional hierarchy is dominated by men. Male dominated courses are unattractive. Girls in these courses are noticed for their sexuality, not their ability. Girls have to prove themselves to be committed and better than average.

Angela Srivastava

Papersession I.4

ATTITUDES, BEHAVIOURS AND PREFERENCES OF SUBJECTS AT SCHOOL

Luigia Bosman
Fostering gender equity in science and technology education
Jackie Bradshaw, Sue Clegg, Deborah Trayhurn
An investigation into gender bias in educational software used in English primary schools
Joke van Heugten, Marijke van Vonderen
Choice of subjects at pre-university level
Leila Räsänen
The gender gap in learning physics concepts

After a short introduction of the four papers in the session the discussion began with examining the role of cultural contexts in influencing development of subjective norms. The work on computer images for software used by young children, indicated that gender neutral characters used with young children already signified gender and were interpreted as gendered by children. The role of cultural contexts and parents possible accentuation of norms was questioned, was the response found in UK likely to be repeated elsewhere? Speakers from Romania felt that a global cultural context was not possible, finding that education practisers reflected society rather than influencing development in society. This was developed as J. Eccles pointed out that cultural context affected decision making, attitudes and perceptions also. The software images paper indicated the need to deconstruct the images presented using examination of the signification process itself as art practitioners had shown that simple reversals of gendered images are not successful in subverting stereotypes. This meant that readings of the images are worded with children, teachers and parents very early. This would develop reflexinity of childrens thinking and make gender readings conscious. Further work was needed to examine the extent of choice and images used in East European countries.

Definitions of good models of pupils vary culturally as do pedagogic models applied in different countries. In some countries children and staff may have to be taught to use freedom (Latvia). The metacognition of learning and the work of Vygotsky and Davidoff were questioned in terms of their models adequacy for dealing with gender. This, Räsänen, explained, treated the teaching/learning situation as identical for all pupils leading to Beyers suggestion that Angubel and Nowak focus on the role of the teacher and language use may be a profitable source for development of a common platform for inclusion of gender in social construction. Work in Romania, to develop a new maths and science curriculum for schools, will be based on cognitive processes developing links and levels of pupils abilities/skills and abstractions.

The need for early intervention with parents and their influence, to counter the gendering of subject matter prior to pupils meeting it, was stressed. As suggestions, out of schools activities, a possible network for science centers, early work in science starting from everyday experiences with curriculum changes for science particularly were stressed. A reminder that a theory of decision making was still needed closed the session.

Deborah Trayhurn

Papersession I.5

ACCESS TO ENGINEERING EDUCATION

Erik Andreasen
A newly formed integrating education
Angela Srivastava
Gender and science and technology 1992
Joan Wolffensperger
Gender issues in masters programs
Hanna Ziajka, Eugenia Malewska
Vocational and technical education in Poland with particular stress on agricultural schools

The papers were presented and discussion followed. The group was divided into groups of three people. Each group discussed the papers and then fed back their questions and observations to the whole group in a plenary session.
There was some discussion about Hanna Ziajka and Eugenia Malewska's paper concerning first of all the question as to whether it was necessary to run programmes aimed at increasing the number of women in agriculture. Hanna argued that there was no need for any special strategies. It emerged from discussion that approximately 50% of university and 15% to 20% of technical university staff were women in Poland. Technical universities are more related to engineering and industry specific disciplines and universities are much older institutions dealing originally with humanities. Hanna Ziajka argued that the aims of males and females differed in relation to family considerations. There was some debate about the nature of work; in particular what constituted a hard job.

It was said that in The Netherlands in the past it were the daughters of farmers that entered agricultural education. Discussion developed on the subject of women in agricultural society and argued that the situation had changed somewhat in recent times. Data gathered in The Netherlands indicated that women were in much higher proportions in certain branches of agricultural science, exceeding the proportion of males. Examples included food science and environmental technology.

In Poland it was stated that recently competition had been introduced in the selection of students for agricultural courses. The female candidates did consistently better. It was suggested that they were more highly motivated. Research into how much time boys and girls spend on homework indicated that in The Netherlands males and females devoted equal time to their homework but that this was the lowest in the European countries studied.

There was discussion relating to Angela Srivastava's paper about access programmes and their part in reducing barriers to women in higher education. The need for equal opportunities policies, monitoring and research was discussed. The role and percentage of male staff in the context of masculine culture was raised but not developed.
A question was raised concerning the course referred to by Erik Andreasen for Export Engineers. He explained that the women on this course had to contend with the "nick name' of Escort Girls. This was seen as an undermining devise used by men on traditional engineering courses. Academics also contributed to this by putting forward the argument that the course was a bit of everything with a superficial view of engineering. First destination statistics showed that the positions and salaries of graduates from this course were at least as high if not higher than those graduating from traditional engineering courses. There was general agreement that supportive fathers and background were important factors with respect to women entering engineering.

It was asked: Do we need to greatly change traditional engineering curriculum or do we create new courses to increase the proportion of women in engineering and technology based industries. Some argued strongly that it was teaching methods and subjects in the curriculum that needed to be changed and not the development of new courses. It was seen as necessary to train good teachers and focus on the use of feed-back from students. It was said that it was no good "to add more women and stir" as this would not challenge the dominant masculine culture. It was generally agreed that the demographic problem was currently obscured by the recession in the West but that in the future this factor would lead to pressure for changes aimed at increasing the number of females studying science and maths in schools.

It is difficult to discuss the significant points of similarity and difference between so called Western and Eastern European countries. It seems that it is necessary to develop a framework for analysis if mutual benefits are to be derived from future GASAT workshops.

Andrew Gale

Papersession I.6

ENCOURAGING WOMEN TO PROFESSIONAL EDUCATION AND CAREER DEVELOPMENT

Jan Harding
Changing images: women's institutes and science
Anne Randmer, Viive Krips
Estonian businesswoman '92 - sketch of a portrait
Diana Thompson
Positive action to encourage women returners to follow higher education courses in computing: A case study

A summary of the three papers was presented: from Estonia the training of women to run small businesses, from the UK, a project to prepare mature, unemployed women (over-25 category of Euro Social Fund [ESF]) in information science to Higher National Diploma level, and a science course for Women's Institute [WI] members. This latter course was designed to break down the alienation 'ordinary' women felt towards science, the course could be used for a qualification and a few women went on to enrol in further formal courses.

Discussion

- How do you get funding?

(Diana) It needs to come from outside the universtiy. The ESF funding is for two years only and then a further application has to be made. ESF contributes 45% of cost, the university 55%. But if ESF funding is not given in the future, the course will not run. Women do not have to be registered unemployed to get on the course but they cannot have been employed, for tax purposes, during the previous year.
(Jan) Funding for the WI course came from the Committee On the Public Understanding of Science [COPUS]. It was a one-off, seeding course which is likely no to be repeated. The WI is now expected to encourage science activities in its regions. COPUS will fund a seminar for the science 'experts' in the regions (those who have responded positively to an enquiry as to their willingness to help WI groups) to share ways of working with mature

women, who 'reject' science. Some 'Hands-on' science/technology centres are being encouraged to make their centres more women-friendly and to explore the possibility of equiping a mobile unit which would be available to resource meetings in village halls, etc.

* WISE buses [WISE - Women Into Science and Engineering]
Information was given about the buses equiped with technology units: pneumatics, electronics, mechanics, which have become available in the UK since 1984 (WISE year). Several participants had visited or used a bus. The idea and use of such a bus was criticized as follows:
- the units were 'traditional', not related to real life and problem-solving,
- the equipment often did not work,
- every girl would have perhaps half an hour in the bus - What use is this?

* How can courses for women go beyond 'fun'?
Jan described how she used the unit 'Wash'n'Wear'. Small experiments were made with water; e.g.:
- Comparing the sizes of drips from an eye-drops tube. Pure water makes larger drops than water-with-detergent. Why?
- When powder is shaken on a dish of water (just to show up the surface) and a tiny amount of detergent touched into the centre, the powder shoots to the sides. Why?
- Why can't you blow bubbles with only water? Detergent and water make bubbles. How is water held together?

From thinking about these and other simple experiments we make guesses about the structure of water. This can lead to simple structure of the atoms of hydrsogen and oxygen.

Papersession II.7

VALUES AND EMPLOYMENT IN ENGINEERING IN EAST AND WEST EUROPE

Ruth Carter, Gill Kirkup
Why do we still have so few women engineers in Europe and the USA?
Ludmila Gurjeva
Social-economic position of women of Siberia during the crisis
Vitalina Koval
The impact of new technology on men and women

The following issues were suggested as arising from the three papers:

1. Comparability of the title 'engineer' and its social status East/West.
2. The role of the military in technology and as a driving force in industry. Visible in the East, pervasive but invisible in the West. The connection between militarism - technology - masculinity.
3. Values - female, feminist values/male values. Women's values are not necessarily feminist values.
4. Protective legislation for women in employment: is it helpful, what is its effect on the status of women/their wellbeing/their children?
5. Strategies for support for domestic work and childcare.
6. Demands on the system/state/structures/individual men.

The majority of the discussion dealt with protective employment legislation and its impact and legislation in the East for flexible working for women. Historical comparisons were made with 19th century legislation about women's work in West. The dreadfully hard, physically demanding, work with long hours that many Russian women must still carry out, was compared with the variety of choices, in theory, open to women in the West.
Common feminist values were felt to exist and to form a possible basis in the East and the West for redirecting technology towards 'humanist' objectives rather than militaristic ones.

Gill Kirkup

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Papersession II.8

RESTRICTIONS AND STRATEGIES IN CAREER DEVELOPMENT

Marja Brand
"Sjhhhhh Mommy is reading" or Work and family issues affect us all
Sonja Hall, Deborah Trayhurn
Views of women managers working in the U.K. petroleum industry
Valentina Zlenko
Women's status in the Ukraine: employment, training, education, career development

Sonja Hall raised three questions from her paper:
What can be done to tackle gender-powered work relations?
What must organizations have to help women enter senior positions?
Do ♀-only networks help women aiming at senior management?

The Ukraine has been an independent state since July 1991. The economy is in deep crisis - high inflation and unemployment. There are 20 political parties. The Republican parties do see a solution to unemployment by encouraging ♀ to return to their homes.
The most important for young people is not education but how to earn high salaries, teaching salaries are low (less than bus drivers). Some girls are even turning to prostitution (which is now permitted) to earn good salaries. Over ten million ♀ engage in some form of economic activity, but 80 % is unemployed. 61% of the ♀ have higher specialist education. But only 3% had undergone special inservice training because this doesn't often improve employment position and because of lack of time due to responsibilities at home.
♀ are continual to be victimized in economic and polictical spheres. It is not seen as appropriate for ♀ to be in these spheres. Now there are some new openings for ♀ in small businesses e.g. banking.
Recently an Ukrainian Centre of ♀'s Studies has been created but it has no funding. There is only one government department concerned with ♀'s issues, but this is in the Department of Sociology. A commission in the parliament has a bureau for women and children but this is led by a man! There are only 12 ♀ in parliament.

♀-only networks

Discussion about the value of ♀-only networks is only useful if these networks are well organized.

Since 1990 women in Romania have been confronted with three things:

1. Attitudes against ♀.
2. Model of Romanian ♀ in parliament, some had poor reputations.
3. ♀ voted for the former president. Men considered that this was due to hormonal influences. The former president was often on TV and was good looking.

So now we can see the reaction against the promotion of ♀, because in the recent past the wrong ♀ were promoted. Women accept this, -interested in going back into traditional women's activities- prostitutes, models.

If ♀ get high positions, ohter women are suspicious of the relationship with her boss. Lots are to be gained by international co-operation between women's movements.

A question was asked about sidelining of ♀ within companies and how to avoid this. Opportunity 2000 (a UK initiative) was introduced and the virtues of monitoring which categories of jobs women filled and setting targets for the future. There is a tension between the economic recession and utilizing women's skills.

The difficulty of taking time out to have children particularly for women on short term contracts was discussed; the model of career development is a male one.

A new strategy has been tried with some success in UK by argueing that research projects will be in jeopardy if key ♀ researchers take time out to have children so projects are not completed on time.

Does levelling of managament structures (either through introduction of new technology or devolution of budgets) make lives easier for ♀? If it means working with a small team so that if one person does not take all (her) heavy burden, close colleagues have to do extra. Devolution produces high accountability but lack of overall (financial) control.

Some survival manuals for careers in education, management and industry for ♀ have been produced.

Papersession II.9

WORK AND FAMILY: HAVING IT ALL

Gisela Notz
Women want both: job and family
Olga Plávková
Women's employment in creation of labour market in Czechoslovakia
Els Veenis, Anja van den Einden
The limitations to the support for working mothers and caring fathers

After introducing the authors each of them summarized the main points of their papers. Conclusion after the short paper presentation was that in spite of differences a clear picture appears: it is a struggle - and more so for mothers than for fathers - to combine work and family.

The first question raised in the discussion concerned the social class of research groups since - as was pointed out - child care problems may be solved with money, for example by employing a nanny. This solution had not been encountered in any of the studies.

Another question concerned the provision of child care facilities by the state. The picture seems to be that in Western Europe, excluding Scandinavia, women's participation in the labour market is relatively low, and so is the provision of child care facilities. In Eastern Europe before 1989 all women were working full time and sufficient child care facilities were provided. These facilities are now disappearing, thereby creating problems for women since they want to remain in the labour market on full time. It was mentioned that if women do have a job and do earn money they can set up private child care facilities themselves, they do not need to rely on the state for assistance.

It was stressed that it is important that women have a choice of whether to work full time, part time or be a housewife/mother. This choice, however, must be a real choice, by ensuring the existence of sufficient child care facilities, since it is very difficult to re-enter the labour market after having opted for the housewife/mother solution for a period of time. It was pointed out that a part time job - a strategy often encountered in Scandinavia - does make the woman economically dependent upon her husband's income.

A statement was made that when the labour market needs women child care facilities will be provided but when the women are not needed any more, dominant ideology will be strongly in favour of motherhood. In a reaction to this statement it was said that motherhood is more than ideology - it also concerns quality of human life, and is deeply embodied in women, whereas fatherhood is a social structure.

In conclusion it was said that the situation has to change both in family life and in working life in order to reduce women's struggle for combining work and family.

Mona Dahms

Papersession III.10
RESEARCH METHODOLOGY

Andrew Gale
Women into construction: relfections on findings and recommendations of two recent evaluation exercises on experimental insight courses for school students in Britain
Tamara Sivertseva
The role of the family in the life of muslim women in Russia
N.M. Sretenova
Some reflections on the feminist paradigma concerning gender and science

The three papers presented were very diverse.
Discussion began by considering whether there could be a 'language' of feminist research. However, awareness of cultural differences in concepts was thought to make a common feminist language difficult to attain. The danger that linking feminist research to qualitative (subjective) techniques rather than quantitative (objective) techniques, could reproduce the very stereotypes and disadvantages that it was trying to address was painted out. Discourse shouldn't be divorced from practical effects.

Eastern or oriental philosophy was not the answer, being male dominated in practice. Post modernism, and deconstructing conscious reality was suggested as a method, but was not generally accepted.

It was suggested that males could be involved in feminist research, as long as they were limited in number.

There was much discussion about dichotomies: male/female, quantitative/qualitative, local/universal, western/oriental: these dichotomies often needed to be overcome.

There was no general conclusion about a paradigm of research, other than that several contributors suggested using a variety of methods.

Alan Durndell

Papersession III.11

EVALUATION OF INTERVENTION STRATEGIES

Karin Beyer
Project organized university studies in science: gender, metacognition and quality of learning
Ilja Mottier
Technology assessment and women's studies: where do they meet?
Suzanne Wilkinson
Giving girls a taste of technology

Karin described the project-based courses at Roskilde University and the effect of learning in this way on students, teachers and the curriculum. Gender perspectives overlay the project courses. There has been an increase in the numbers of students on project courses and also those involving physics and maths. Project courses focus particularly on students having responsibility for their own learning and this has been a very successful pedagogy. "Ownership breeds success".

Ilja outlined the nature of technology assessment [TA] and the research areas, that the TA-unit in which she works has examined. She sees commonalities between discussions about the integration of TA into the mainstream issues and the earlier discussions about the integration of women's studies into various areas of the curriculum.

Suzanne described the four day taster course in technology at Oxford Poly. The evaluation of the course showed a great lack of information from girls about technology and careers open to them. There was an increase of 40% in those who would be interested in a technological career after the taster course.

K. Beyer's paper

Roskilde University has a reputation for project work, so the students are self-selective, they perhaps are less conventional already.

However, its more difficult to teach the conceptual structure of science and technology through project work, so half of the time is devoted to courses which teach the content. But work on the project may then give students a deeper understanding of the content areas.

I. Mottier's paper

Is the best strategy integration of women's studies into all areas, or separate areas? A strategy that does both is preferable.

There is a great deal of interest in TA from engineers, as they see advantages to society, but its not considered important to consider gender as well. Although we have enough knowledge to integrate gender issues with TA etc. how do we get the power to do so with so many players in the game, particularly when bidding for funds for EEC projects. It is therefore important to ensure that men also work towards the goals that women aim at.

S. Wilkinson's paper

The three technical universities in The Netherlands have been running two day residential technology taster courses for the past eight years. The ages of girls who come to these courses are 15-18 yrs. It is very difficult to find good projects that give a general cross faculty view of technology. In the first few years the impression was that the number of girls was increasing, but now it seems to be decreasing.

About the four day taster course at the Oxford Poly: Often the cost of running these courses is hidden, e.g. staff time is not fully costed.

In Sweden, such courses have been run since 1976. They found that the courses tended to be too superficial - students need a lot of follow up. Costs were reduced by getting present students to host the 'taster' students and provide accommodation for them. Numbers of students did slowly increase around this time, but other factors may also have had an effect.

In 1982-1983 in conjunction with employers' unions, the 120 girls attending the course spent one month in industry. This initiative was very successful and increased intake of girls to 29% (30% in mechanical engineering). These were not the girls who had attended the course -the initiative created a positive atmosphere for the university which encouraged other girls. After a few years the funding ran out and the girls also needed wages for the one month industrial placements. The moment the initiative ceased, the numbers of girls dropped.

Papersession IV.12

CHALLENGE AND PERSPECTIVES OF EUROPEAN PROJECTS

Geoff Chivers
Gender issues within the EC's COMETT programme and the influence of the WITEC
Tatyana Izhevska
Academic careers of women in Ukraine
Jan Raat
Gender and technology education in Europe

No report received.

Workshop 1

SCHOOLCAREER COUNSELING

Workshopleader: Anja van Vlerken NVBI

No report received.

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Workshop 2 and Workshop 7

TALE OF O

Workshopleader: Helen Hootsmans

The tale of O is an audiovisual presentation based on the book 'Men and Women of the Corporation' of Dr. Rosabeth Moss Kanter. It deals with the problem of being different in a group. The problem of one or a few O's in a group of X's. Being different refers to race, sexe, age, religion, language, function, weight or length. Essential is that you are in a minority position. After viewing the audiovisual we discussed about feeling an O with the help of some questions.

When did you feel an O?

In politics with all males. In my family, they are not as educated as I am. As a (male) student with a different point of view. When I have to contact authorities and present myself as a feminist. As a young researcher.

When do you feel an X?

At special weekends with my close friends. At conferences like this. Aboard of a plane. With my sisters.

Can you be recognized as an X or O?

Depends entirely on the situation and how you feel about it.

Is being an O an advantage or disadvantage?

They tell you things they wouldn't tell you if you were an X. More contacts because everybody talks to someone special.

You get a chance to give your opinion. Sometimes you want to be in the spotlight and when you withdraw from it you regret it. Yet being in the spotlight can bring lots of pressure.

Is it ever possible to be exclusively O?

Aren't we all both X and O? Isn't O-ness just an attribute of difference and it changes depending on the context and the content? When the difference is significant then you feel like an O.

Who is making the decision whether you are an O?

It is important that you are aware of your own situation and the way you think about yourself.

Workshop 3

PROJECTWORK IN HIGHER EDUCATION: ENGINEERING AND SCIENCE

Workshopleaders: Karin Beyer and Anette Kolmos

The aim of the workshop was to share with the participants some experiences of projectwork. The organizers are teachers and researchers at technical or science departments at Aalborg University (AK) and Roskilde University (KB). Both universities offer programmes/studies which are problem oriented and project-organized although they differ somewhat in the subject-area covered and in the applied procedures.

At the start of the workshop, Anette Kolmos gave an introduction to set the scene. The participants had to imagine themselves as first year students at Aalborg University. They were then divided into projectgroups and asked to discuss possible problems related to a given theme and topic, to decide on the methods or procedures to focus down the problem-area to a reasonable problem for the projectwork to follow.The groups were also asked what courses they would like or have set up to support their projectwork.

The groups were given 20 minutes before they had to report their ideas, plans and wishes to the teachers at a plenary session. A general diccussion of various aspects and difficulties of project organized teaching and learning followed. The workshop went on for about 1 1/4 hour and there was no time for the planned more systematic summing up of the principles, the aims and possible procedures of project-organized university studies. Still the participants seem to have had a good and interactive experience.

Karin Beyer

Workshop 5

INCREASING THE INTEREST OF WOMEN FOR EXACT AND TECHNICAL COURSES AND STUDIES

Workshopleaders: Ria Hermanussen and Joke van Heugten

Which intervention projects aiming at more women going into technical studies and careers, are best used? In the workshop this question was discussed using four theses about girls/women and science and technology.

The first two theses were about which factors (e.g. curriculum change, teaching methods, single sex classes, etc.) are best used for interventions and at which point in the life-school-cycle?
It was generally agreed that each intervention is a good one if it meets the following conditions:

- there are as many actors as possible involved: teachers, parents, peers, even employers
- the intervention is sustained: it does not take place at just one moment in time, but it is continued.

There was little support for single sex schools, because it may result in a better achievement for girls in science and technology, but girls get into trouble socially. Apart from that it would make boys in single sex classes rather sexist. Seperate classes for girls and boys for a few subjects (e.g. physics and maths) is a good idea though. Someone remarked all-girl classes are good for teachers too, because they learn to pay attention to girls' responses, while in mixed classes they are often geared at boys' responses.
About interventions at secundary school in the age group 14-18 years it was said: 'intervention is never too early, but also never too late.'
Further remarks were about the difficult age of adolescence for girls: if the age in which one has to choose subjects in secundary school is about 14/15 years (like in The Netherlands) girls drop out of science. Later on they cannot choose a technical study because of the too high tresholds that universities of technology build for their incoming students. For example in The Netherlands physics and mathematics B (i.e. science oriented maths)

are required for entrance at a university of technology.

The last these (the third one we missed because of lack of time) posed the question: can a technical study and a technical profession be attractive for girls too?
If the relation between humans and the technical side is made visible, if it is clear that technology is made by people and for people, than it will be more attractive for girls. For example in Sweden there are 27% girls at technical universities and they are most in studies that are important for women and society, such as environmental studies.
It is different in East European countries: in Romania there are no sex differences in learning styles or results, as many girls as boys study technology: women are as able in abstract studies. Maybe it is because there are strong economic incentives for women too to study technology or to work in a technical field.

Joke van Heugten

Workshop 6

DEVELOPMENTS IN THE ENGINEERING PROFESSION: ADVANTAGE OR DISADVANTAGE FOR FEMALE ENGINEERS?

Workshopleader: Hanneke de Bruin-Scheepens

The discussion in our group both started and closed with debate about the image of the engineering profession. Functions in engineering are heavily stereotyped as demanding and masculine, and we discussed extensively the 'ideology' around these professions.

Since some members of the group came from Eastern Europe, we spend quite some time listening to information about the position of female engineers in this part of the world.

Though the prepared statements were not really used as an outline to discussion, there was a lively conversation going on for more than one and a half hour. In short we present some topics and conclusions.

1. Image of the profession

As we mentioned before, the engineering profession in general is seen as very demanding: it is not regarded to be a 9 to 5 job. However, we should keep in mind there are other professions -that seem to attract more women- in which the time demands are as uncertain, like for instance medicine. Especially for women it turns out to be difficult to combine the tasks of an engineer with other responsibilities. Women that work in engineering professions are often in an isolated position. That is why it is very difficult for women to obtain the 'credits' needed to realize changes in the professional environment in order to ensure a better combination of activities. Being the only woman 'on the floor' could have both advantages and disadvantages, mostly the latter outnumber the first.

2. Lessons from Eastern Europe

Most Eastern European countries have a higher percentage of female engineers than is common in the West. In Russia for instance, 58% of all engineers is female, just like 51% of all physics students at university. A reasonable explanation for this is given by the fact that all Russian pupils must attain the same program at school during 11 years, this program contains relatively much mathematics, physics and chemistry. During this period there are three exams on all courses for all pupils; it turns out that female pupils are even slightly more successful than boys.

The compulsary character of this program with a large beta-oriented part, apparently makes an exact and technical advanced education for females much more accessible. It is said that the age at which kids get interested in science and technology is different for boys and girls: boys start at the age of 12 or 13, while it takes till the age of 15 or 16 for girls.

According to the East European women, the entrance of girls into technical and scientific education and professions, affected the prestige and salary of these 'male professions' in a negative way.

Furthermore, the large percentage of female engineers does not ensure them a stable position in the labourmarket. In time of economic depression (as is the situation in all Eastern European countries), experienced female engineers get as often unemployed as less educated women (in Russia 80% of all unemployed is female).

The implementation of new technologies did not help female engineers to get a better position. Frequently women are excluded from training and retraining courses (partly because of their obligations at home). The result is that nowadays often male managers are appointed to decision-making positions, even to positions that were held by females before. When there is a need for newly developed technology in industrial corporations, even female engineers in management positions, hire young male specialists to help them. Somehow even women theirselves are systematically underestimating the capacities of other women.

3. Some conclusions

- Compulsary courses in physics and maths to all pupils up to the age of 16 seem advisable.
- Technical innovations work out badly for female engineers in countries where they are already extra burdened by heavy family tasks. Innovation in itself is certainly no guarantee for better chances for female engineers.
- In times of economic depression even well educated and experienced female engineers get as easily unemployed as other women.

Workshop 9

HOUSE OF THE FUTURE; A HOUSE TO LIVE IN?

Workshopleaders: Annemarie v.d. Vusse and Marjon Menten

After a description of the house of the future by Annemarie and Marjon and a lot of critical notes everyone started to think about their own ideal houses in four groups.

Assignment:

What kind of criteria do you have for an ideal home? Take into account the way people actually live in your country. Write down, discuss, make a picture etc.

The four groups wrote down their criteria:

I

Square rooms, safe, you don't have to clean it, warm, dry, nice to live in, big/a lot of space, garden, sound proof (inside/outside), it has to save energy and should have: washer/dryer, stove/oven, refrigerator, freezer, personal computer with games, radio, compact disc player + good music, all working with solar/wind energy.

II

Flexibility: different lifestyles, OK for young and old, variety.

No more technology than necessary and which is useful, no more control than necessary, enough room for both co-operation and privacy, no animals and no smoking.

III

Safe place, personal unique crazy things, place to be creative, library, efficient household equipment, on the ocean coast and Irish wolfhound space.

IV

Fresh air, privacy, silence, possibility for pets, making music/place for instruments without disturbing others, trees/environment/neighbours, cosyness/cosy atmosphere, not outward orientated but inward orientated and what about the church of the future?

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Workshop 10

KEY ISSUES FOR INTERDISCIPLINARY WOMEN'S STUDIES COURSES

Workshopleader: Gill Kirkup

The workshop examined in some detail the Open University (UK) course Issues in Women's Studies. This is a multi-media distance education course with almost one fifth of the course dealing with issues of gender, science and technology.

We discussed the problem of introducing theoretical writers such as Fox Keller and Harding to interdisciplinary students on an introductory women's studies course, the importance of introducing students to these writers in a way and at a point in a course which makes them accessible. We discussed the importance of beginning with issues that concern women - e.g. domesic technology or ecology and working into the theoretical. We talked about how most of us had been working hard to introduce issues from the Third World, and non-white women, we must now work equally hard to introduce issues form Eastern Europe.

Gill Kirkup

Workshop 11
ITEM

Workshopleader: Els Loeff

The objectives of Integration of Technology Emancipation and Management [ITEM] are to increase the number of highly qualified women in technology management and intermediary professions and to improve their career prospects.
The three main activities are:
- (re)training projects
- courses
- research and advice

In the workshop we looked at how to introduce innovations along the lines of a quality system. That includes finacial aspects, time management, organizational aspects, quality assurance and information management.

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Workshop 12

EVERY DAY TECHNOLOGY AS A TOOL FOR CHANGING ATTITUDES AND CREATING SELF-CONFIDENCE

Workshopleaders: AnnMarie Israelsson and Lo Fisher Teknikens Hus

The workshop began with a brief presentation of how the Teknikens Hus is structured and operated to develop understanding of how technology works and some of the science involved. It starts from 'real' technology and moves towards principles, not the other, more traditional move from principle to application.

The local technologies of the region are used: timber, mining, steelmaking, papermaking, hydroelectric power and building. In papermaking, for example, the paper is produced in the industrial way, not as in handcrafted paper, but the information given is limited.

Everyday technology is also used: a kitchen, a bathroom and a garage have been constructed.

Fifteen staffmembers are employed, including 5 trained teachers. They work with teachers, children and local council workers and design and make new exhibits.

In teaching children, close collaboration is maintained with the schools. Many teachers (mostly women) have attended courses, 97 % of the women teachers are fearful of technology at first.

Local authorities sent their complete cleaning staff to a course. Many of them have low education and poor self-image; a number of them has Finnish as first language. Many come reluctantly as they are sent to the Teknikens Hus for development training. Their course uses the three rooms for hands-on activities. In the kitchen they fit together a plug, some flex with a switch, and a light bulb. They take to pieces a watertrap from under a basin in the bathroom and change the washer in a dripping tap. In the garage they change a windscreen wiper. Many exclaim how easy it is (their husbands make it seem so onerous!) and resolve to go home and fix that tap!

Discussion

* How was the Teknikens Hus set up and how was it funded?

Discussions began in 1980 and the Hus was opened in 1988. Funding was obtained from local industry to build the Hus (on the university campus at Luleå where AnnMarie headed up the Information Office at the time). An investment fund was set up to contribute to on-going costs. Local councils made commitments to contribute and, later, government grants (temporary) were obtained.

* What position is taken on advertising for sponsoring companies?

No advertising is accepted, but real products do carry their manufacturer's labels.

* What if a group contains a woman already familiar with the technology?

She is asked to help or encouraged to work with an other exhibit, using a workbook provided.

* Can anyone attend a course and what does it cost?

Some occasional courses are offered for the public and the cost is small so as not to discourage participation. Admission to the Teknikens Hus is free. The public can use the workbooks.

* How do you evaluate?

Each course is evaluated by informal discussion and written feedback. Teachers report on their classes reactions. A research programme is being designed to evaluate the cleaning staff course.

Roundtable

GENDER AND SCIENCE AND TECHNOLOGY IN EUROPE
GESTE

Discussionleader: Monique Volman

Short introduction about GESTE

GESTE stands for GEnder and Science and TEchnology.
In Sweden the first initiative was taken, the aim was to stay in touch between the GASAT conferences.
At the next GASAT conference in Australia other interested people were found. At this moment 40 people are already interested in the network.
For a long time nothing happened, but this year the initiative was renewed. We got financial funding from three Universities in The Netherlands to make a new start with the network. The financial support is meant for the following activities:

- possibility for structural base
- investigate who/how many persons are interested
- database/newsletter.

Everyone introduced her/himself shortly and mentioned what she/he expect from a network like GESTE.

Some of the statements that were made:

- a network helps to get in contact with similar researchers,
- to be informed/to inform colleagues,
- link in to international research,
- interested in teaching the teachers,
- interested in an overview in the research field,
- please don't duplicate WITEC!,
- interested in strategies to get all the knowledges,
- overview activities/research,
- supplying an interactive database, not another newsletter,
- the network will be of help to all of us.

With which ideas we came up and where we discussed about:
It is clear that WITEC does not overlap with GESTE. GESTE will be more limited and will provide specific information about research in certain fields and will bring people in contact with other researchers and developments.

A newsletter really is a one-way communication. Everyone is really happy to get one, but there is no feedback at all. So a newsletter does not provide a network. Everyone agrees on the idea of an interactive database.

We discussed quite a time about the design and form of the database: should it be large or narrow, how is the accessibility, should it be polyglot, should it be a part of the GASAT association. A lot of questions and no ready-made answers!

For Western Europe an interactive database would be very useful. For Eastern Europe it is a little bit more difficult, because of the lack of technology. It is possible to send these countries a print-out of the database.

Main thing of the discussion is that most of us are interested in the GESTE network and do agree on the idea of an interactive database.

Oda Weyers

POSTERPRESENTATIONS

GESTE
GEnder and Science and Technology in Europe

Technica 10
Primary science club for girls

Hilde Scholtens
University of Twente

WITEC/UETP
Claire Molyneux and Geoff Chivers
The COMETT programme for Women into Technology in the European Community / University Enterprise Training Partnership

Governmental projectgroup Women and Technology
Ans Compaijen (Ministry of Education and Science)

Integration of Technology Emancipation and Management [ITEM]
Els Loeff

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